Mirroring Interaction

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An exploratory study into student interaction in independent working

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Voorwoord

Hier ligt het dan, mijn proefschrift. Het is een boek vol spiegelingen. Niet alleen spiegelt het boek de weerspiegelingen van de leerlingen en docenten waar ik de afgelopen vier jaar mee gewerkt heb, het boek weerspiegelt ook mijn eigen bespiegelingen op het discours waarin ik leerde deel te nemen.

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Dit boek markeert het einde van een intensieve en invloedrijke periode. En tegelijkertijd vormt dit boek het startpunt van het begin van de rest van mijn leven.

Dordrecht, november 2011
Femke Nijland

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CHAPTER 1

Introduction

1.1 Introduction and purpose

This book presents an exploration into student interaction in seatwork, with a special focus on the question whether students construct knowledge in their verbal interaction, and if so, how. Seatwork is a popular teaching method in Dutch secondary education. Based on the general notion that students learn by doing and by interacting with task and subject matter (Bonset & Rijlaarsdam, 2004; Vygotsky, 1986), many Dutch teachers let their students work independently on tasks during class. These tasks are mostly textbook tasks, which are sometimes meant to be carried out in groups, but more often individually. During classroom periods of seatwork, teachers generally allow their students to interact with each other, despite the often individual character of the tasks. By allowing student interaction, seatwork often ends up as a collaborative effort of two students in adjoining seats.

Despite the popularity of seatwork in Dutch education, student interaction in this situation has not often been studied. Most studies into classroom interaction focus on situations in which learning through verbal interaction is expected or even elicited, like teacher-student interaction or student interaction in collaborative learning situations. Most studies into seatwork focus on the learning revenues of the tasks or of the teaching method itself, but rarely on the nature of student interaction.

When asked during the course of this study, teachers provided three different reasons for letting their students interact in seatwork. Some teachers allowed interaction as a way for students to unwind, as a break from the continuous listening and learning that a student's day inevitably entails. Other teachers mentioned allowing student interaction as a form of classroom management. They encouraged their students to discuss their questions regarding the tasks with each other to limit the number of questions asked to the teacher. Still other teachers allowed student interaction in seatwork as a form of collaboration. All teachers in my study, however, indicated not knowing to what extent these aims were met, or even what exactly students discussed during their interaction.

Although teachers are usually present in seatwork periods, it is difficult to get more than a general notion of the dynamics of the verbal interaction of over twenty speakers. Therefore, the question how students interact in seatwork is a question that remains unanswered, both by researchers and educational practitioners. An interesting question

is whether students verbally construct knowledge during their interaction. Theories on verbal interaction and learning indicate that verbal construction of knowledge may occur in every type of interaction (Halliday, 1978; Wells, 1994), making student interaction in seatwork no exception. A study into this matter could therefore result in both a better understanding of the interactional dynamics of seatwork interaction and an understanding of the potential educational benefits of student interaction during this much practiced teaching method.

In this chapter I discuss the outline of my research project. I situate the subject in its empirical context: seatwork in contemporary Dutch secondary education, and I discuss its relevance. I then present the development of the questions that guided this study and I elaborate on the approach taken to conduct the study. I conclude this chapter by presenting the structure of this dissertation.

1.2 Seatwork in Dutch secondary classrooms

1.2.1 Dutch secondary education

The nature of contemporary Dutch secondary education is heavily influenced by the educational reform issued in 1998. This reform, called Second Cycle (Bonset & Rijlaarsdam, 2004), was aimed at the senior years of secondary education at pre-university and pre-university of applied sciences level. The reform not only included several changes in curriculum planning, but was also accompanied by the development of the Study House (Bonset & Rijlaarsdam, 2004). This last concept is a metaphor that includes a pedagogic approach in which student autonomy in learning is central. Among other things, the Study House advocates teaching methods such as independent working and independent learning, to better prepare students for higher education and for the participation in contemporary society (Veugelers, 2001). The role of the teacher in the Study House changed from instructor to both instructor and coach, guiding students in their process of learning to learn, with the ultimate aim of guiding students towards self-regulated learning (Bonset & Rijlaarsdam, 2004). The Steering Committee (1996) that prepared the educational reform characterized the Study House as containing:

> *(…) less centrally offered material, more tasks for students with which they can work independently, less explanations with chalk on the blackboard, more individual guidance, sitting with one or two students, less teacher control, more student autonomy. Even when it goes wrong, because ultimately we learn the most when we make mistakes*. (p. 5) [translated from Dutch by the author]

The idea of the Study House had a diverse influence on the organization of everyday Dutch secondary classrooms. To stimulate professionalization of schools and teachers, both were free to implement the aims of the Study House as they saw fit. The precise implementation therefore differed from school to school, and from teacher to teacher

(Kruijer, 2001). In general however, the everyday Dutch secondary classroom showed a decrease in teacher instruction-time, an increase in the use of work planners which provide an overview of the work to be done to enable students to plan their own work (Dekker & Elshout-Mohr, 1997) and an increase in students working independently from the teacher (Tweede Fase Adviespunt, 2005).

1.2.2 Defining seatwork

In general, seatwork can be characterized as a classroom situation in which students work individually on tasks concerning a particular school subject. Fisher *et al*. (1978) define seatwork as reading or writing tasks completed without immediate, direct teacher supervision. Anderson (1984) signals that although individual products and individual efforts are expected, the work is usually done in a social setting: "Other students are working autonomously at the same time, often working on the same assignment. This social setting affects how (and sometimes if) individual students complete their assignments" (Anderson, 1984: 93). The Dutch classroom is no exception: Students are to work independently, but most often in a social setting. Seatwork is therefore seldom done individually. Often seatwork takes the shape of collaborative working on tasks designed for individual completion. Nystrand and Gamoran (1997) characterized seatwork therefore as a form of small group work named 'collaborative seatwork'. Seatwork is also known as 'independent working' or 'autonomous working', in this study I will however use the term 'seatwork'.

One of the main differences between seatwork in the Dutch classroom compared to other countries, is the role of the textbook. According to Bonset and Rijlaarsdam (2004), in the Dutch secondary classroom, the textbook determines most of the teaching-learning process. Commercial textbooks dominate the Dutch curriculum, in contrast with other countries where the teacher develops learning materials himself. Bonset and Rijlaarsdam (2004) put this phenomenon down to the relatively large number of hours Dutch secondary teachers teach weekly: 26 in a fulltime job. In the Dutch classroom textbooks play the role of 'hidden' teacher. The textbook stipulates 'default' instruction and learning paths (Bonset & Rijlaarsdam, 2004). The implementation of the Study House even added a second hidden teacher: the work planner, used to enable students to plan their own work (Dekker & Elshout-Mohr, 1997). In seatwork, the textbook plays a crucial role: both as a provider of learning materials and as a co-instructor for seatwork. This latter function is shared with the teacher and, when used, the work planner.

Bonset and Rijlaarsdam (2004) characterize seatwork, or independent working as they call it, in the Dutch classroom as a form of learning in which the teacher and the instruction materials determine students' learning and the manner in which it must be carried out. They emphasized the fact that students themselves have little choice in how they work and what they work on. After all, as Boekaerts and Simons (1995) argue, the learning is teacher controlled. Bonset and Rijlaarsdam (2004) do however characterize seatwork as a necessary phase in the process of learning to learn. They perceive seatwork as a step in the developmental process aimed at handing over

learning control from teacher to student, ultimately working towards raising independent and self-regulated learning in the teacher's lessons.

Seatwork is a contradictory situation in several respects. It often contains individual tasks, yet interaction and collaboration are allowed and sometimes even stimulated. The learning in seatwork is teacher controlled, which means that students have little autonomy. The teacher however cannot control the verbal interaction of over twenty students, which provides the students with a certain amount of verbal freedom. Seatwork is highly structured, yet perceived as a necessary step on the way towards learning to learn, one of the main aims of the educational reform of 1998. In contemporary Dutch secondary education, seatwork is often synonymous with collaboratively planning and completing textbook tasks. The nature of students' interaction during this situation is largely undiscovered territory. Studies into student interaction during other teaching methods have shown that student interaction in general can be fertile ground for the verbal construction of knowledge (Mercer, 2008; Mercer *et al*., 1999; Nystrand *et al*., 1997a; Rozenszayn & Assaraf, 2011; Wells, 2001).

1.2.3 Verbal construction of knowledge

As pedagogical and educational research has shown (Mercer, 2008; Nystrand, 1997b; Wells & Arauz, 2006), verbal interaction in general plays an important role in the construction of knowledge. Knowledge is constructed at the interplay of experience and the use of symbolic systems, like language (Halliday, 1993). Through interacting verbally with others, people construct new notions and new understandings and thus knowledge. My theoretical approach concerning the relation between language and learning is discussed in depth in Chapter 2.

An exploration into student interaction and into the way students possibly construct knowledge during their interaction would contribute to our understanding of seatwork as a teaching method and could provide insights into the way students deal with seatwork. The goals of this study were modest. I aimed to explore how students interact, with a special focus on the possible verbal construction of knowledge. I did not aim to draw conclusions on students' learning. I therefore explicitly used the notion 'verbal construction of knowledge' in my study, to indicate a way of interacting that could lead to cognitive restructuring or learning. I did not study students' cognitive restructuring, only a form of interacting that is considered to very likely lead to cognitive restructuring or learning (Mercer, 2008).

In search for the verbal construction of knowledge in classrooms, educational studies tend to focus on situations in which the construction of knowledge is expected or even elicited, such as teacher-student interaction or student interaction during situations designed for collaborative learning (Atwood *et al*., 2010; Barnes *et al*., 1971; Nystrand, 1997b; Rozenszayn & Assaraf, 2011; Webb *et al*., 2009b; Wegerif & Mercer, 2000). These studies have not only resulted in thorough descriptions of the audible characteristics of the verbal construction of knowledge in interaction (cf. Chapter 2 and 4), but have also identified a number of factors that facilitate its occurrence. One of these factors is that students have to feel safe. They have to feel that they can

contribute freely to the conversation without being graded or evaluated (Burns & Myhill, 2004; Wood, 1992). A second factor is that students have to have relative freedom in the work they do. They have to be given some form of autonomy in what they work on and how they do it (Nystrand & Gamoran, 1997).

To some degree, both these factors are applicable to seatwork. In seatwork, students are quite free in their verbal contributions. It is one of the few occasions in class when the students' verbal utterances are not all controlled or evaluated by the teacher. In addition, although students' freedom in what they work on is usually limited, students are relatively free in how they work on their tasks. In theory, therefore, the occurrence of verbal knowledge construction in student interaction in seatwork was not unlikely. One of the questions in my study was whether verbal knowledge construction did indeed occur in student interaction in seatwork.

1.3 Relevance

A study into the dynamics of student interaction in seatwork is relevant to both educational research and practice. From a scientific point of view, a study into student interaction in seatwork, and on the verbal construction of knowledge within this interaction, is interesting, since studies into classroom interaction have been predominantly focused on situations in which the verbal construction of knowledge was expected or elicited. It would be an addition to the current understanding of classroom interaction to investigate if and how the verbal construction of knowledge occurred in situations that were not designed to facilitate this and in which student interaction occurred more or less spontaneous. A second scientific reason for studying student interaction in seatwork can be found in Nystrand and Gamoran (1997). They showed that seatwork actually lowers student achievement, which they attributed to the lack of autonomy students experience with this way of working. A study into the nature of student interaction in seatwork could shed light on the reasons for this.

From a more practical point of view, a study into student interaction in seatwork may clarify how students use interaction with their peers when working independently from the teacher. Teachers generally know only to a certain extent what their students talk about in seatwork. Some teachers worry that students may talk too much about topics other than their tasks. A better insight into the nature of student interaction could help them apply this teaching method more effectively. In addition, insight into the way students verbally construct knowledge in seatwork and insight into how the verbal construction of knowledge could be stimulated, might be of use to improve students' learning. Teacher training institutes, lastly, might be able to use new insights to prepare their teacher trainees in applying this teaching method.

1.4 Design

Since the factors that play a role in both student interaction in seatwork and the verbal construction of knowledge within this interaction, were difficult to predict in advance,

I planned on an emergent design (Patton, 2002), which allows for changes into the research design as understanding deepens. The flexibility of this approach allowed me to conduct a true exploration by studying that which would appear to be the most relevant in the course of the study. As a consequence, the exact course of the project was not planned out beforehand. At the start of the project, only an initial research question and accompanying design were constructed. Other questions emerged in the course of the project, which ultimately leaded to three studies into student interaction.
In this section I will discuss the course my research project took, starting with the first study. To do justice to the emergent approach of my research I describe how each study lead to the design and approach of the next. I end with the central question that emerged from these three studies.

Study 1

I started my exploration with a general question concerning the nature of student interaction in seatwork:

How do students verbally interact with each other in seatwork?

To answer this question I planned on studying student interaction in seatwork exactly as it occurred in the classroom. I designed a research approach with a naturalistic character, using data gathering methods that caused minimal disturbance to the students and the teacher in their everyday classroom. I asked teachers for permission to observe a regular lesson, recording student interaction and teacher instruction using small voice recorders, and gathering all written materials after class. In addition I interviewed both teachers and students after class.

To describe and analyze verbal student interaction in seatwork, I needed an analytical framework that allowed me to describe the functions of language students used in seatwork. To construct such an analytical framework, I used a combined approach. I derived descriptive concepts concerning classroom interaction from prior research on verbal classroom interaction. Using part of my own data derived from study 1 in a pilot study, I adjusted these concepts to fit seatwork. A discussion of the construction of this analytical framework can be found in Chapter 4. The analytical framework constructed was usable, yet not complete. Every study in the project resulted in additions and adjustments to the analytical framework.

Study 2

The first study resulted in some interesting findings concerning the nature of student interaction in seatwork and its relation to the instructions students received from both the teacher and the written task. Based on these findings I designed the second study. This second study focused on student interaction during a different form of working independently from the teacher: collaborative learning. The following question was central:

> What aspects of teacher and task instruction influence students' language use in collaborative learning as compared to seatwork?

Both the nature of the task and the role of the teacher were different from those in seatwork (study 1). The tasks were larger and more complex than the average textbook task. Students were to conduct research into a subject of their choice. Students designed their own research projects in small groups and had to collaborate to conduct the studies properly. The role of the teacher was aimed to be a coaching one, facilitating and guiding their students in conducting research. In conducting this study I again used a naturalistic approach, to study student interaction without disturbing the situation. The second study not only resulted in answers to the question posed, but also in additions to the analytical framework.

Study 3

Since the first and second study provided me with a description of what aspects of the instruction of the task and the teacher influenced the nature of student interaction, I designed the third study as an experiment to test whether changing these instructions could change the nature of student interaction in seatwork. The following question was central to this study:

> Does changing the teacher instruction to one containing more content-related and exploratory functions of language, result in student interaction with more content-related and exploratory functions of language when working independently on textbook tasks?

I conducted this study in collaboration with four teachers. Together we tried to change the way they instructed their students, and in addition we selected specific textbook tasks. Our aim was to see what effect these changes would have on the nature of student interaction in seatwork and to find out whether the teacher instruction could stimulate the verbal construction of knowledge in student interaction in seatwork.

Central question

As the description of the three studies showed, the emergent design of my exploration not only resulted in a study of student interaction when using a different teaching method than seatwork in Study 2, it also resulted in a focus on the instructions students received before working independently from the teacher in Study 2 and 3. The central question that this project ultimately answered, emerged from the three studies and was formulated:

> How do students verbally interact when working independently from the teacher and how does student interaction relate to the instruction they received?

This question is answered in the final chapter of this book, based on the results of the three studies I conducted.

Timeline

Figure 1.1 shows the course of my research project. I started my project with the construction of the analytical framework in the summer of 2006. I started the collection of the data of the first study in the fall of that same year, followed by the collection of the data of my second study in the fall of 2007. In the spring of 2009 I started my experiment. As Figure 1.1 illustrates, the construction of the analytical framework was a constant factor in my project. I used this for the analysis of every corpus of data, and adjusted it when necessary within every study.

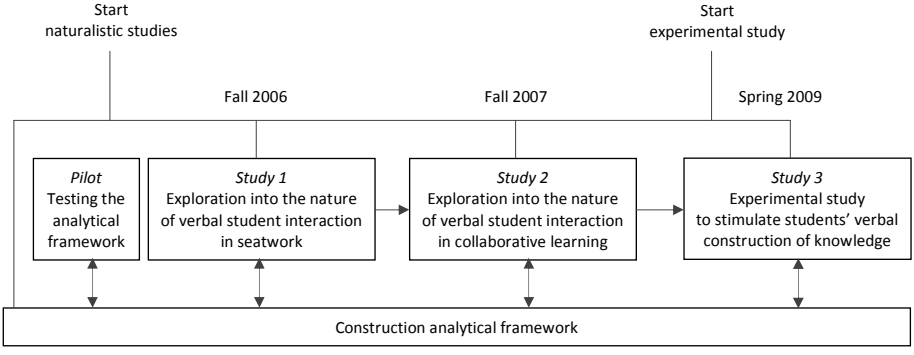

Figure 1.1: Timeline research project

1.5 Outline of this book

This study into student interaction in seatwork starts with a theoretical overview of the relationship between language and learning in Chapter 2. The theory behind the assumed relationship between language and the construction of knowledge is discussed and an overview of studies on verbal interaction in the classroom is provided. The chapter closes with an overview on student interaction in the Dutch classroom.

Chapter 3 provides an overview of the methodological foundations of this study. In Chapter 4 I discuss the construction of the analytical framework that I use throughout this study to describe student interaction in seatwork. Chapters 5 to 7 each present the results of one individual study. Chapter 5 presents a study into the nature of student interaction in seatwork. The chapter describes the characteristics of student interaction as it took place in my research situations, including how student construct knowledge in their verbal interaction. Chapter 6 presents a study into the nature of student interaction when working in small groups on complex tasks. Chapter 7 presents the results of a study on a way to stimulate the verbal construction of knowledge in student

interaction in seatwork, based on the results of the previous two studies. Lastly, in Chapter 8, I answer my research questions and the central question, which I subsequently discuss.

CHAPTER 2

Language and learning

2.1 Introduction

In a study on verbal student interaction in seatwork in secondary education, the concepts of language and learning deserve a detailed discussion. In this study I perceive learning a the social construction of knowledge, or metaphorically: as the entering of a discourse (Bruffee , 1986). Language plays an important role in the process of entering a discourse. Most obviously as a means transmit information, but more sophisticated, in occasionally being the very motor of the construction process.

In this chapter I discuss the concepts of language and learning as a theoretical foundation for my empirical studies. The relationship between language and learning is discussed in three sections. Section 2.2 starts with a discussion of the role of language in social interaction in relation to learning. In Section 2.3 I explore the role of language in formal education, focusing on the situations that have most often been studied: Teacher-student interaction and student interaction during small group work such as collaborative learning. The results of studies into these verbal situations provide a theoretical guide to the educational situation this study focuses upon, i.e. seatwork. In Section 2.4 I discuss the role of language and learning in Dutch educational research and practice. In the past decades, new insights into the relationship between language and learning influenced not only scientific studies into this matter, but also educational teaching and practice. I will discuss these changes and relate them to my research question.

2.2 Entering communities of discourse

2.2.1 Language as a social tool

All cognition, according to Bruner (1996) relies upon representation, or as he described: "On how people lay down knowledge in a way to represent their experience of the world" (p. 95). Representation is a process of construction rather than of mere reflection of the world, Bruner (1996) argued. In the course of human evolution, many systems for representation were constructed. According to Donald (1991), these were sparked by the growth in size of the social group. The increase in social structures

surrounding men imposed greater demands on memory and demanded more effective ways to live together, necessitating means to share knowledge. This resulted in several representational systems like pre-symbolic forms of social intelligence, of which language can be perceived as the ultimate system.

Language is first and foremost a social tool. According to Donald (1991), its coming into existence was sparked by social activity and its primary role was to mediate in social life. But the possession of language resulted in more than the ability to mediate in social life. Donald (1991) argued that once the mechanism was in place for developing and rehearsing narrative commentaries on events, an expansion of semantic and propositional memory was inevitable. In addition, the language system provided humans with a tool for attentional control, and allowed for a rapid access and self-cueing of memory. Language provided a means of conscious, volitional manipulation of concepts. It thus opened a door to learning without needing to experience something yourself. The relationship between cognition and language can therefore be characterized as a two-way street. Cognitive changes led to language. The use of language, in turn, led and leads to cognitive change.

It was cognitive change in the human species due to his social setting that sparked the phylogenesis of language, according to Donald (1991). According to Vygotsky (1978), in the ontogenesis of language, this process is considered to be reversed. In the individual, it is language itself, its acquisition and use, that for a large part drives a person's cognitive development. He emphasized the role of language in the learning of children, because, according to him, learning was primarily a social and cultural process, not an individual process. He argued that learning takes place in interaction with others, through the sharing of knowledge and the constructing of understandings in culturally-formed settings. The process in which people are integrated in a culture, or are enculturated, is what Vygotsky calls 'learning'. In this process language plays an essential role, for it provides the means for coordinating action and for thinking.

Vygotsky (1978) distinguished several functions of language that are derived from each other and complement and enhance each other. First and foremost, he claimed that language has a communicative function. It is a mediator for social activities, a social tool that shapes and constitutes our social relations. Second, as a consequence of the previous, language facilitates the constitution of, and even constitutes, higher cognitive functions, like verbal thinking. The third function that Vygotsky (1978) distinguished, is the result of both the communicative and the cognitive function. As Vygotsky argued, language enables people to perceive reality as more than just shapes and colours. Language provides meaning to objects, to the world around us (Vygotsky, 1978). The use of language can turn a long and pointy object into a ceremonial sword, and something round and black, with two hands, into a clock. Language thus constitutes a large part of reality, not only the reality inside a person's mind but also the reality that exists between people, i.e. culture.

2.2.2 Language and learning

Michael Halliday (1925) formulated a theory that can be regarded as an addition to Vygotsky's theory on language and learning, as described by Wells (1994). Halliday (1993) applied the understanding of the basic principles of language use and acquisition in his Language-based Theory of Learning. Where Vygotsky stressed the social nature of language and learning, Halliday stressed their semiotic character: Two approaches that are complementary (Wells, 1994).

Halliday (1993) argued that the ontogenesis of language is at the same time the ontogenesis of learning. Children are predisposed to interact communicatively and to interpret experience by organizing it into meanings. Signs are created at the intersection of these two modes of activity. They evolve in mediating interaction with others, and in construing experience into meaning. This process of making meaning is what Halliday perceived as 'learning'. Halliday (1993) worked from the assumption that knowledge is more than the remembrance of facts. Knowledge is meaning and learning is the social construction of events and experiences into meaning. This process of making meaning is essentially a semiotic process, Halliday (1993) argued. Symbolic systems, or semiotic tools, act as mediators between the world and our understanding; between events and the meaning we attribute to them.

The most powerful symbolic system or semiotic tool is language, because of its semantic structure (Wells, 1994). Semantic structures encode experience which enables its users to interact with others in order to not only coordinate activity, but also reflect on and share interpretations of experience, and thus create new meaning, or knowledge. Learning can be characterized as the expansion of the meaning potential. New meanings are construed in interpersonal contexts and transferred to ideational ones (Halliday, 1993). Moreover, language is capable of creating a semiotic world of its own, that exists only at the level of meaning, but serves both as a tool and as a metaphor for the real world. As children we learn to navigate in this world. This semiotic world is necessary for the construction of higher-level meanings, like scientific theories. As Halliday (1993) argued, all theories are themselves semiotic constructs and theory-building is a semiotic process.

Through social interaction, children not only learn to speak and constitutively learn to think. Through social interaction they also learn to learn. Vygotsky (1978) argued that learning can not be separated from its social context. When all cognitive functions originate in social interaction, all learning must be social too. As Vygotsky (1978) argued, learning is the process by which learners are integrated into a culture and language is the primary means with which children are enculturated (Vygotsky, 1978), seeing as language is the primary means with which adults act out social structures, affirming their own statuses and roles, and establishing and transmitting shared systems of value and knowledge (Halliday, 1993; Vygotsky, 1978). In Halliday's (1993) terms: The way adults attribute meaning to events and experiences, influences the way children view the world, view reality and ultimately the way they attribute meaning to events themselves.

Concluding, Halliday (1993) argued that learning is attributing meaning, a semiotic process. Once we have developed the power of semiotics, we encode many of our

experiences in semiotic terms (Halliday, 1993). According to Vygotsky (1978), this encoding of experiences originates in social processes. Social structures and experiences are necessary conditions to both acquire language and higher cognitive processes when we are children, and to guide and frame our meaning making as adults.

2.2.3 Social reality and communities of discourse

The concept of 'culture', or 'social reality', plays an important role in the relationship between language and learning. Learning and cognitive development are rooted in culture. As Mercer (1994) argued, this does not oppose possible innate elements in cognitive development, but it does suggest that learning is saturated by culture. Learning is a consequence of culturally contextualized events, as Mercer (1994) argued. A study of learning therefore must consider the social reality in which understandings are acquired. To understand the nature of this social reality or culture, it is important to define the concept, and how it relates to the concepts of language and learning. I will discuss this in this section.

People use language in interaction with each other. This language-in-use is what Gee (1999) referred to as 'discourse'. According to Bakhtin (1981) all discourse is essentially dialogic, even discourse that at first sight seems monologic, such as written texts or verbal task instructions. Every utterance, whether verbal or written, has its roots in the context, in previous utterances and anticipated ones, so every utterance is in its core reciprocal. Therefore, the dialogical nature of discourse implies that an utterance can only be understood within the 'organized interrelationships of the conversants' (Bakhtin, 1981). Vygotsky's (1978) ideas on the role of language add that the meaning of discourse cannot only be explained by the organized relationship of the conversants, but that it also creates this organized relationship. People construct their social reality, and structure their social relationship by communicating meaning, and thus by using discourse.

Gee (1999, p. 7) described the organized relationship of conversants as 'ways of being in the world', in which a person recognizes himself and others as meaning and meaningful. Social reality is a patchwork, Gee (1999) claimed, of acting, interacting, feeling, believing and valuing, using characteristic objects, symbols, tools and technologies. In their discourse, people constitute activities and identities as a part of their social reality. Gee (1999) defined all elements concerning people's social reality that are constituted when using discourse as Discourse, with a capital 'D'. As Gee (1999, p. 7) argued: "We are all members of many, a great many, different Discourses, Discourses which often influence each other in positive and negative ways, and which sometimes breed with each other and create new hybrids". These Discourses with their shared systems of value and knowledge have been given many different names with definitions that differ only slightly from each other. They vary from 'social societies' (Goodwin *et al*., 2002), 'discourse communities' (Britton, 1974; Bruffee, 1986; Harris, 1989; Kent, 1991) and 'communities of practice' (Wenger, 1998) depending on the context in which the term was used.

In this study I will refer to these social structures as 'communities of discourse' or 'discourse communities'. This concept stresses both the social and the linguistic aspect of these shared realities. In addition, the plural indicates that there can be more than one type of social structure. In this study 'discourse communities' are defined as groups of people sharing more or less the same systems of values and knowledge (Halliday, 1993). Different discourse communities each have different perspectives on reality. Within every discourse community a usually tacit agreement exits about what counts as valid knowledge, argument and example (Van Veen & Van de Ven, 2008). These conflict as well as align with those of other communities (Harris, 1989). Communities of discourse are made up from the collective interactions of people, today and in former times. Each member adds to the defining characteristics of the community by participating in it through interaction with others (Bruffee, 1984).

2.2.4 Entering a discourse

In the previous sections the concept 'learning' was discussed as a social process in which language plays an important role, both as a means to share knowledge and as a means to construct and transmit the systems of values and knowledge of discourse communities. Working from this assumption, Bruffee (1986) argued that learning is 'entering a discourse'. He perceived learning as learning the way of talking, thinking and reasoning as constructed by a particular group of people, i.e. a discourse community. By learning to talk the way members of a discourse community talk, a person becomes a member himself. The entering of a discourse by aspiring members does not necessarily have to happen under the guidance of a member. Bruffee (1984) argued that because people are already members of several communities their knowledge of other discourses can open doors to new knowledge communities. Being a member of a certain discourse community could however also close doors to other memberships. In becoming a member of a community of discourse, a person not only acquires the knowledge system of that community, he also acquires a sense of what knowledge or meaning is valid and what knowledge is not (Bruffee, 1984), which can constrain the entering of other communities of discourse. Every individual can be regarded as a member of a number of different communities of discourse simultaneously. One can be a member of the discourse community of a family, of a school, of a certain work environment, of a country, even of a private community existing only between two people, all at the same time.

These different communities of discourse also come into play in the classroom. School itself can be regarded a community of discourse with accompanying systems of knowledge and values. When starting to attend school, children enter the discourse of the school. They learn to speak the language of the school, they learn the shared systems of values and knowledge of the school, and they learn what counts as valid knowledge, argument and example. School subjects, too, can be perceived as different communities of discourse. As Van Veen and Van de Ven (2008, p. 44) argued: "(…) different disciplines can be construed as different discourses." Learning in different school subjects can be interpreted as the entering of the discourse of these communities. In some situations in the classroom this entering comes about under

explicit guidance from the teacher. In other situations this entering may come about in interaction with peers, for instance in student interaction when working independently from the teacher. In my explorations I worked from the assumption that there is a relationship between the use of language and learning, in which the concept of communities of discourse played a pronounced role. I perceived the classroom as an environment in which students are members of certain discourse communities and aspiring members of other discourse communities. I perceived learning as the 'entering of a discourse', as Bruffee (1986) proposed. I therefore interpreted student interaction in seatwork as one possible opportunity in class where students might enter the discourse of a certain community.

2.3 Language in the classroom

2.3.1 Small group work and verbal interaction

Both Dutch education an education in other countries have shown a high level of interest in small group work. Bennett, Hogarth, Lubben, Campbell and Robinson (2010) distinguished several factors that have contributed to this. In an educational environment that is more and more influenced by the idea of learner-centered education, small group work is a method to move away from teacher-dominated interaction. In addition, in small group work students' interest can be stimulated, promoting ownership of the knowledge constructed (Bennett *et al*., 2010).

Nystrand and Gamoran (1997) argue the term 'small group work', however, can be rather misleading since the teaching method may involve a great range of activities from highly structured by the teacher to open-ended. They studied a large number of occurrences of small group work. In defining the nature of small group work they propose a continuum, ranging from 'collaborative seatwork' to 'autonomous problem solving', based on the level of autonomy students receive and on the nature of the task (Figure 2.1).

Teacher structured		Student structured
Collaborative seatwork	Structured problem solving	Autonomous problem solving

Figure 2.1: Continuum of small group work (Nystrand & Gamoran, 1997)

Nystrand and Gamoran (1997) argued that teachers in general shape group work, by assigning tasks and establishing parameters of interaction. With collaborative seatwork, the parameters of interaction are entirely defined by the teacher, and the task could just as easily be done without interaction among students. In structured problem solving, the students receive more freedom in their interaction with each other and display spontaneous student interaction on the subject matter of the lesson. However, the interaction is still rather prescribed. In autonomous problem solving the teacher clearly defines group tasks, however without prescribing the interaction. This results in

significant student interaction defining both the shape of task and the outcome. Effect research has shown that especially this last type of small group work attributes to the cognitive and social development of students (Linden, 1999; Nystrand & Gamoran, 1997).

Some specific characteristics of the small group work form that Nystrand and Gamoran (1997) called 'autonomous problem solving' have been found to contribute to this development, namely the design of the task, the level of autonomy students receive, the composition of the group and the nature of the teacher's interventions during small group work. The task students work on in autonomous problem solving contains open-ended questions, instead of questions with pre-specified right and wrong answers. Only open-ended questions promote coherent student interaction. In answering right or wrong questions students do not build on each others' responses (Nystrand & Gamoran, 1997). The design of the task provides students with a significant degree of autonomy over the learning activity (Bennett *et al*., 2010). Nystrand and Gamoran (1997) add that autonomy is a crucial factor here: Experiencing no or little autonomy actually decreases students' achievements. The design of the task furthermore requires students to collaborate. Students feel the need to discuss and argue about the task, explain the subject to each other, supply information and complement each other's weak points (Veenman, 2001).

Groups function more purposefully and students' understanding improves when different views are represented, both within the task and within the composition of the group (Bennett *et al*., 2010; Slavin, 1995). Effective cooperative learning groups consist of good, average and weak students working together. In these situations, all types of students achieve better learning results (Slavin, 1995). Atwood, Turnbull and Carpendale (2010, p. 361) argued that it is the articulation of diverse perspectives by students, acting as a collective resource, and conflicting perspectives clarified through classroom talk, that has a positive influence on the intrapersonal learning processes. This is reached through for instance explanation, clarification, or justification (Van Boxtel *et al*., 2000; Webb *et al*., 2009b). These views are in line with Nystrand's (1997b) emphasis on the effectiveness of diversity in teacher interaction and Bakhtin's (1981) notion of 'heteroglossia'

The articulation of conflicting perspectives is regarded as an excellent way to encounter different systems of values and knowledge and thus new discourse communities. The exploring of these conflicting perspectives may lead to verbally constructing knowledge in interaction with others. The occurrence of conflicting perspectives can therefore be regarded fertile ground for verbal knowledge construction (Nystrand & Gamoran, 1997). A crucial element in the effectiveness of the notion of 'conflicting perspectives' is the way students deal with them. When they show an open attitude towards the opinions of others, knowledge may be constructed. However, when students show constraining relationships and the articulation of differences, the occurrence of conflicting perspectives merely result in disputes (Mercer, 2008).

Studies into small group work also examined the relationship between teachers' interventions and the quality of group discussion. A detrimental effect was found with teachers giving students direct instruction on and direct help with the task content

(Chiu, 2004; Dekker & Elshout-Mohr, 2004; Gillies, 2004). Student groups provide more detailed explanations when they work with teachers who ask open and tentative questions, who probe and clarify and who focus student thinking (Gillies, 2004), as did student groups working with teachers who give only process help, encouraging students to explain and justify their work (Dekker & Elshout-Mohr, 2004). Webb *et al*. (2004) found that issuing reminders or giving directives about students' verbal behavior during small group work did not stimulate student explaining in groups. Dekker and Elshout-Mohr (2004) however found that reminders about behavior did seem to stimulate groups to share ideas. Webb *et al*. (2009) explain this discrepancy by hypothesizing:

> *[…] that what matters in terms of teacher interventions with small groups is not whether teachers provide help that focuses on the subject matter content of group work versus guidance about what collaborative processes groups should carry out, or whether teachers should provide more-explicit versus less-explicit content help. Rather, what may be important is whether teachers try to ascertain student thinking and base their interaction with the group on what they learn about students' thinking on the task.* (p. 51)

2.3.2 Teacher-student interaction

The role of the teacher in verbal interaction in the classroom is considered quite an important one. The teacher's verbal production of language in his instruction influences both the learning process of the student, and the classroom as a community of discourse. In Section 2.2 I argued that learning is the entering of aspiring members into a community of discourse. In the classroom the community of discourse is constructed by both the teacher and the students. Learning is, after all, a dialogic process in nature (Wells, 1999). However, although all discourse is inherently dialogic (Bakhtin, 1981), it can be treated as though it were monologic (Nystrand, 1997b, p. 14).

Gutierrez (1994) distinguished three different 'instructional scripts' teachers use when interacting with their students: A recitative, a responsive and a collaborative-responsive script, in which the teacher treats discourse increasingly dialogic. In a recitative script the teacher shows little or no acknowledgement of students' self-selections, he discourages or ignores students' attempts to introduce subtopics, students' answers are short and response elaborations are not encouraged. The teacher initiates test-like questions for which there is only one correct answer; and in his interaction he indicates that the implied goal is to contribute these correct answers. In a responsive-collaborative script on the other hand, both teacher and student self-select in taking turns to speak, they both initiate subtopics, students' answers are elaborate, students' responses build on previous responses. Interaction contributes to the construction of shared knowledge, which the teacher indicates as the implied goal (Gutierrez, 1994).

In addition to Gutierrez (1994), Nystrand (1997b) also distinguished forms of teacher instruction in the classroom, based on the way teachers treat classroom discourse. Nystrand made a dualistic distinction. He distinguished 'monologically

organized instruction' versus 'dialogically organized instruction'. These forms of interaction have accompanying underlying beliefs concerning knowledge and learning. Nystrand (1997b) argued that the type of talk teachers use, is indicative of an implicit theory of knowledge (see also Atwood *et al*., 2010). Important to note concerning this dualistic distinction is that it does not automatically imply that every teacher instruction is strictly either one or the other. Scott, Mortimer and Aguiar (2006) found that within one instruction, monologically organized instruction or 'authoritative discourse', as they call it, was often followed by a segment of dialogically organized instruction or 'dialogic discourse' as they call it, and vice versa (Scott *et al*., 2006). Nystrand (1997b) presents the characteristics of monologically organized instruction and dialogically organized instruction as represented in Table 2.1.

Table 2.1: Key features of monologically and dialogically organized instruction (Nystrand, 1997b)

	Monologically Organized Instruction	Dialogically Organized Instruction
Paradigm	Recitation	Discussion
Communication model	Transmission of knowledge	Transformation of understandings
Epistemology	Objectivism: Knowledge is a given	Dialogism: Knowledge emerges from interaction of voices
Source of valued knowledge	Teacher, textbook authorities: Excludes students	Includes students' interpretations and personal experience
Texture	Choppy	Coherent

Monologically organized instruction takes the shape of recitation. Knowledge is perceived as something that has to be transmitted, from teacher and textbook to student, which results in choppy language use, in which topics are just briefly addressed before moving on to the next topic. The underlying perception of knowledge is that it is a given, consisting of unchangeable facts which can be transmitted from one person to another. Dialogically organized instruction on the other hand presents itself as a coherent conversation in which topics are discussed instead of addressed. Students are active participants, whose perceptions and ideas are perceived as valuable additions to the emerging knowledge. Knowledge is considered to be the transformation of understanding and the negotiation of meaning, instead of a given.

The fact that recitative instruction is called 'monologically organized' does not mean that it is non-interactive. Teachers do ask questions, students answer them and teachers in turn evaluate the responses -the so called IRE- or IRF-sequences: initiation, response, evaluation or feedback (Gutierrez, 1994; Nystrand, 1997c; Wells, 1993). The questioning, however, is mainly aimed at continuing the line of monologue of the teacher (Mercer, 1995, 2008). The nature of this interaction can be regarded 'procedural display' instead of 'substantive engagement' (Heath, 1978). As Heath (1978) argued: In procedural display, reciprocity is limited to classroom rules and regulations,

and students mainly seem to be 'doing school'. The consequence of merely going through the motions of school is that students quickly forget what they have learned (Heath, 1978; Nystrand, 1997b). Choppy interaction results in choppy knowledge.

Dialogically organized instruction is more interactive, more conversation-like and more coherent (Nystrand, 1997b). Both teachers and students contribute to the conversation as equals. Students profit not only from their own talking, but also from what others contribute. Students profit from the enabling effects of each utterance upon the others (Britton, 1974). Diversity and conflict are important characteristics of this type of instruction. By expressing competing opinions and negotiating meaning, knowledge is constructed. In monologically organized instruction, diversity and conflict are suppressed by the perception of the nature of knowledge, which can lead to disengaged, off-task students (Nystrand, 1997b). Classroom culture influences the verbal behavior of students, for instance what kind of questions students feel allowed to ask, or are willing to risk to ask, as Kachur and Prendergast (1997) phrased it.

Dialogically organized interaction, however, has some risks of its own. In recitative education, the teacher is linguistically dominant in the classroom (Edwards & Westgate, 1994; Myhill & Dunkin, 2005). This is true not only in the managerial role of organizing, turn-taking and maintaining order, but also in the qualitative role of determining which contributions are to be valued and which knowledge is considered 'right' (Edwards & Westgate, 1994). In dialogically organized instruction, "lessons are expected to unfold partly in response to student contributions and a sequence of classroom interactions that cannot be entirely predicted", as Nystrand (1997d, p. 89) argued. Teachers who use this type of instruction must therefore have an in-depth understanding of what they teach, since student contributions can be unpredictable (Nystrand, 1997c). In addition, teachers need let go of their linguistic dominance, knowing that sometimes students thwart their lessons with off-task contributions. And most important of all: they have to let go of their verbal dominance, knowing that within a fixed period of time a fixed body of knowledge has to be dealt with, which is often tested in a much more recitative way (Nystrand & Gamoran, 1997).

2.3.3 The student and verbal interaction

The classroom can be viewed as a part of the community of discourse of the school, with its own ways of talking, and its adhering systems of knowledge and values, i.e. with its basic routines, rules, norms, and goal-oriented activities associated with learning (Atwood *et al*., 2010). Apart from the community of discourse of the school, other communities can come into play in student interaction, like the community of discourse of the school subject. Most studies on student interaction focused on describing how students entered the adhering discourse and constructed knowledge belonging to the discourse community of the school subject.

These studies have for instance resulted in the distinction of several modes of interaction, each with a different effect on the way students create knowledge together. The form of interaction which has been ascribed a particularly beneficial role in the knowledge creation process is 'exploratory talk' (Barnes, 1976; Mercer, 1995,

2004, 2008). By verbally constructing meaning and adjusting existing ideas and points of view, students create knowledge together (Mercer *et al*., 1999).

Several researchers have distinguished such a mode of language, meaning the same as 'exploratory talk' yet under different titles. All these modes can be characterized by verbal acts such as: Following a sustained argument and discussing it, asking and answering questions (Barnes, 1976), engaging critically but constructively with each others' ideas, offering statements and suggestions for joint consideration, challenging and counter-challenging ideas, offering hypotheses and alternative hypotheses (Mercer, 1995, 2000), reasoning, articulating propositions and clarifying misconceptions about those propositions (Van Boxtel & Roelofs, 2001).

According to Atwood *et al*. (2010), there is growing evidence that student understanding is facilitated by verbal interaction, especially when students are confronted with different points of view and subsequently discuss these different points of view. Wells and Arauz (2006) argued that dialogic orientation enhances student ownership and therefore student motivation for learning. Within verbal interaction with each other, a dialogic orientation can revise the students' own perspectives in light of differing perspectives. "The common understanding thus jointly created is superior to that with which the participants started" (Wells & Arauz, 2006, p. 416).

In addition to this knowledge productive mode of interaction, some less productive modes of interaction have also been distinguished. Mercer (2000) for instance, distinguished three modes of which two could be considered less productive, respectively 'disputational talk' in which students predominantly argue and 'cumulative talk' in which students predominantly agree with each other. Scott *et al*. (2006) contrast their dialogic approach with an authoritative approach to interaction that is mostly teacher-driven and that offers only a single perspective, which they characterize as a less productive way of student interaction.

2.4 Language in education

2.4.1 Social constructivism

The role of language in the learning process in formal education has been subject to much debate. Knowledge has long been regarded as an absorbable object, independent of human activity (Esland, 1971). The educational system and the use of language were organized accordingly: The main focus was on the transmission of knowledge from teacher and textbook to student. The teacher talked about a subject and his students learned by listening. The student read about a subject in his textbook and learned by reading (Barnes, 1976). Learning was perceived as the absorbance of knowledge, offered through language.

In the last decades the view on learning has slowly shifted. Under the influence of primarily the theories of Vygotsky and his followers, the student was ascribed a more pronounced function in the acquisition of knowledge. Instead of a passive reader and a listener, the student came to be seen as a more active participant, a constructor even,

who constructs new knowledge and connects the knowledge he perceives with knowledge he has already constructed. This process takes place inside the learners head, but is for a great deal achieved through the production and the reception of language.

The movement that embodied this shift in the perception of learning, is social constructivism. Social constructivism is an important element in psychology and has its roots in social psychology (Simons, 2000). Point of departure of this theory is that people construct their own (social) reality in interaction with other people. Human perception and judgment are subjective, as are knowledge and learning. There is not one truth, there are many, although some truths are more universally acknowledged than others. Every individual, to a degree, creates his own reality, his own discourse and his own knowledge, which in general lines are shared by other members of the community. These members, in turn, dominate the way in which the individual experiences reality and the way he looks at himself. People are always maintaining and solidifying their identity. A social constructivist views the world in terms of meaning construction processes that emerge in interaction between people who are part of cultures and subcultures (Simons *et al*., 2000).

2.4.2 Language Across the Curriculum

Since the rise of social constructivist ideas in education, the role of language in education has increasingly became the subject of study, especially in the United Kingdom and the United States of America. The greater recognition of the importance of the role of language can be ascribed to the work of James Britton in the United Kingdom and James Moffett in the United States, who contributed strongly to the Language Across the Curriculum (LAC) movement. The LAC movement began in London in 1966 when a group of secondary English teachers met to consider the role of talk in English lessons. Soon, though, their focus expanded to the relationship between language and thought in general, and the functions of language in learning and society, without confining their study to English lessons alone. Barnes (1971) paved the way with his observation that classroom interaction was of much greater importance to the learning process than educators could have imagined. Students not only learned from verbal interaction with the teacher, but also from interaction with their peers (Barnes *et al*., 1971). The role of language in education appeared not to be confined by language as a subject. Teachers of science and of other subjects joined the discussion, resulting in a debate on language in education, language and learning, and finally about language across the curriculum (Language across the curriculum: Guidelines for schools, 1978).

Through the 1970's the LAC movement developed from a slogan and a set of ideas about language and learning, into a coherent, alternative view of learning through language. This was a view with wide ranging implications for teachers of all subjects and their role in the classroom (Parker, 1985). Advocates of the LAC movement have been reluctant to translate its principles into teaching methods; they rather concentrated on posing questions and providing a focus for teachers to explore the relation between language and learning (Fillion, 1983). The emphasis was on helping classroom teachers

to work out for themselves the implications of ideas about language, thinking and learning.

Although theory building was not the main aim of the LAC movement, the movement did develop many ideas on language and learning in the classroom. Two notions played an important role in the theory of the LAC movement. First, there was the emphasis on the instrumentality of language, on language as a means of thinking and learning, which made improved learning the goal of instruction. A context of purposeful use was therefore deemed necessary. Second, there was the notion of dynamic, developmental interconnections among uses of language. Language was argued to have several functions or uses, which were not to be taught separately, because they hardly appeared separately (Parker, 1985). The movement inspired educational researchers to study the role of language in learning in formal education. Building on the work of Vygotsky, researchers like Rogoff (1990, 1991), Bruner (1990) and Wertsch (1991) distinguished three integrated functions of language (Mercer *et al*., 1999), which together are considered to constitute the knowledge construction process:

- a cognitive function, which children come to use to process knowledge;
- a social or cultural function, for sharing knowledge amongst people;
- a pedagogical function, which one person can use to provide intellectual guidance to another.

The studies that followed focused on verbal interaction, particularly in two pedagogical situations: Teacher-student interaction and student interaction during small group work, with a focus on collaborative learning.

2.4.3 Language across the Dutch curriculum

In the Netherlands, the LAC-movement also inspired educational studies. In the 1970's the Dutch teacher journal Moer published several articles on studies into the use of language in educational situations – studies in the style of the Language Across the Curriculum movement, initiated by a group called 'National Working Party on Mother Tongue, and yet not Dutch' [translation of 'Landelijke Werkgroep Moedertaal en toch geen Nederlands']. In these studies the use of language in classrooms was analyzed (both students interaction and teacher-student-interaction), the relationship between language and learning in the classroom was explored, and the use of language in the school as an institution was discussed (De Leeuw *et al*., 1976; Sturm, 1975, 1976; Sturm & Bonset, 1974).

One of the main functions of the school as an institution was considered to be the socialization of its students in the community – and in order for that to happen, the student had to be socialized in the school as a separate community of discourse (Sturm, 1975). The language of the school played an important role in studies concerning language in education (Van der Aalsvoort & Van der Leeuw, 1982; Sturm & Bonset, 1974), especially the discrepancy between the involved communities of discourse: the language of the school and the language of the home. These studies often had an

emancipatory character, directed at students from lower socio-economic backgrounds and their problems in understanding the interactional and lexical characteristics of schools, that were both so different from what they were used to at home.

The relation between language and learning in the classroom was also viewed within the context of communities of discourse. Sturm and Bonset (Sturm & Bonset, 1974, p. 196) signaled: "When a child starts to attend school, with his easy obtained mother tongue, it encounters all kinds of language varieties, emerging around the different school subjects." They argued that verbal interaction in the context of the school inevitably leads to the discovery that the discourse of home was not sufficient to organize reality in school, which was the first step towards new forms of thinking and new ways to describe reality (Sturm & Bonset, 1974). Or, put in different words: The first step towards becoming a member of a new community of discourse. As a means to stimulate students to take this step, Sturm and Bonset (1974) argued that small group work should be practiced more often. In small group work, students had more opportunity to speak than in teacher-student situations, they were allowed to work from their own experiences, and students could use both the discourse of home and the discourse of the school, just as they pleased. Sturm and Bonset (1974) believed interaction in small group work diminished the negative effect of the gap between discourses, that so often lead to problems of understanding between teacher and student.

In 1976 a project started at the St. Pauluslyceum, a school for pre-university education in Tilburg, that aimed to create a cooperation between History teachers and teachers of Dutch in order to tackle the language problems History teachers experienced in their classrooms, like the inability of their students to understand historical texts (Goosen, 1982). The project stayed rather small; it never expanded beyond a handful of teachers, but it was often referred to in Dutch educational research concerning language in education. Van der Aalsvoort and Van der Leeuw (1982, 1992) in turn combined language problems like subject lingo in school, with learning through interaction, inspired by the work of Barnes and Britton (1971). In their two publications they presented a literature survey on the role of language in every educational learning situation. In addition, the 1992 edition contained several options on how education could be altered to give students more space and voice in their own learning (Van der Aalsvoort & Van der Leeuw, 1992).

After this last publication however, the subject of learning through the use of language receded more or less into the background, in favour of a focus on more problematic aspects of language across the curriculum, i.e. problems associated with the academic language register and language disadvantages of a specific group of students. The growing number of students with a non-Dutch background since the 1980's inspired studies on second language use across the curriculum. Since Dutch was and still is the language in which most school subjects are offered, a problem with Dutch often led to problems with other subjects (Van der Aalsvoort & Van der Leeuw, 1992). Studies into this matter therefore formed a contribution to a major social issue. However as a consequence, empirical studies into the relation between language and

learning in the classroom, without a focus on the learning of non-Dutch students, were not conducted anymore.

2.5 Conclusion

The Study House, a part of the educational reform in the Netherlands issued in 1998, lead to a renewed interest in the relationship between language and learning in the classroom. The influence of social constructivist theory had generated a view on education in which students were expected to put concepts into words and acquire knowledge while talking and listening. I aimed to explore student interaction with a renewed focus on language and learning as in the Language Across the Curriculum movement. I started my research into student interaction therefore with empirical studies, making use of the insights on language and learning discussed in this chapter. These insights included the social nature of learning and the way the use of language can lead to learning as discussed based on Halliday (1993) and Vygotsky (1978) in Section 2.2. The relation between these concepts is based on the relation between language and social reality, which allows for the construction of knowledge in social interaction (Edwards & Westgate, 1994; Vygotsky, 1986).

In my study I perceived learning as a social process. I worked from the assumption that learning can be metaphorically described as entering a discourse (Bruffee, 1986). Students all can be perceived both as members and aspiring members of communities of discourse. When entering a community of discourse, students construct its systems of knowledge and values in interaction with others. In classrooms multiple communities of discourse come into play: not only the discourse community of the school, but possibly also the discourse communities of the school subjects and the discourse communities both the teacher and the students are already members of.

In the construction of knowledge in interaction, some modes of interaction appeared to be more beneficial to learning than others (Mercer, 2008), just as some ways of teacher instruction appeared to be more beneficial to learning than others (Nystrand, 1997b). In my exploration of student interaction, although not disregarding the less beneficial modes of interaction, I focus on the modes of interaction that benefit the construction of knowledge.

CHAPTER 3

Research design

3.1 Introduction

This research project aimed to explore the nature of student interaction in seatwork. As discussed in Chapter 1, the project was based on an emergent design (Patton, 2002), allowing the findings of the first study to be the guide for the design and aim of the following studies. Although this approach yielded a valuable opportunity to truly explore interaction in seatwork, it raised some questions on how to report on this approach and the results of the three studies.

I chose to report on the research project as it eventually developed, however doing justice to the emergent nature of the design. For reasons of readability, I present the ultimate course this project took as a linear process, in which the findings of one study logically lead to the design and aim of the next. In reality however, the process was not always linear. At times the process was circular and sometimes even following a dead end trail. My explorations into student interaction resulted in a great amount of data and many findings, some of which very relevant, others interesting but ultimately not suited for this project. Only the findings that appeared to be relevant to the entire story were taken up. Although I present the research project as a linear process, I did do justice to the emergent design of the study in presenting the results. This means that the Chapters 5 to 7, which report on the three different studies, build on each other. The results of each study formed the foundation of the following study, and in this process, some results will appear to be valuable while others will prove obsolete. The book is written as the nature of the project itself: as an exploration.

3.2 General approach

The emergent design I chose for my research project left room for serendipity and for the follow up of promising research paths (cf. Patton, 2002). As a consequence of the design, at the start of the project only an initial research question was formulated and only the first study was designed. I decided to let my interpretations during my studies be leading for the precise course the research and its design would take. This seemingly aimless approach was at times a little disconcerting. It did however have the result that I had in mind: an in depth exploration of the nature of student interaction in seatwork.

I aimed to undertake a total of three small scale, but analytically comprehensive studies. In my explorations I took a naturalistic stance. I believe it is necessary to study a situation as it occurs, limiting interference or disturbances, to be able to understand what happens. I have therefore limited my influence on the research situation in the two studies that had an observational character as much as possible.

In analyzing the data I collected, I used theories on both verbal interaction in general and theories on the notion of verbal construction of knowledge. I perceived interaction as a way for people to make sense of the world. In this sense-making process people construct communities of discourse (Bruffee, 1986) which contain systems of knowledge and values characteristic for that community. People do not only construct these communities of discourse in interaction, by studying people's interaction, the communities of discourse people adhere to can be reconstructed. As Edward and Westgate (1994, p. 7) argued: "[…] talk provides a window to a collaborative discourse through which meanings are shared and constructed". The way people make sense of the world and the norms and values they adhere to, can be discovered by analyzing the language use within the discourse community. I approached students interaction based on these theoretical notions. I reconstructed student interaction to discover how students make meaning when working independently, what values and rules they adhere to and to discover how students verbally construct knowledge.

3.3 Participants

In exploring student interaction, I focused on students that were being prepared for higher education, both pre-university level and pre-university of applied sciences level. The students were 16 or 17 years of age and were in the final years of their education, but before the examination year. The classes in which the students attended school usually consisted of 20 to 25 students. I focused my observations on students who usually sat together, or usually worked together, if places were not fixed. This requirement was installed to prevent unfamiliarity with each other to be an obstacle in the students' interaction. In addition, I studied both boys and girls and ensured a more or less equal division of gender in my research subjects.

The schools at which I conducted my studies had to meet certain demands. First and foremost they had to be schools without a specific educational philosophy. They had to be closest to what in the Netherlands goes for 'average' schools: Rather large schools, providing all educational levels, from preparatory vocational to pre-university education. They had to contain a student population of average socio-economic back-grounds, meaning not predominantly elitist or predominantly black. After visiting a number of schools, I ultimately selected three schools for the three studies. A detailed description of these schools can be found in Chapters 5 to 7.

Since this study is an exploration into the nature of student interaction in seatwork, I did not limit this study to one school subject in particular. I kept a broad scope, to avoid analyses and results being too much influenced by a specific school subject

content. An exception was made in the second study, in which contextual factors forced a certain limitation. Details can be found in Chapter 6.

3.4 Data and data collection

Verbal student interaction in seatwork constituted my main source of data. In all three studies, I recorded students' interaction using voice recorders that were placed on the tables of the students, or, when students moved to other spaces in school, were put in the care of one of the students, to take wherever he or she went. The collection of the students' verbal interaction in seatwork proved no easy task. The collection had to be organized in such a way that the students would be minimally disturbed in their everyday way of interaction. Students appeared to be least influenced when they were "ambushed". Just before the lessons started I would ask students personally if it was okay that I recorded them. After their consent I would place the recorder on the table to record the complete lesson. Since most of the disruption generally took place right after placement of the recorder, which was at the start of the lesson, students were used to its presence at the time they started working independently. In studies in which students were studied more than once in subsequent lessons, the same students were again informally asked for their participation at the start of the lesson, which proved no problem. The teachers were asked to wear the voice recorder under their shirts, which was placed there before the start of the lesson. Students were informed of its presence at the start of the first observed lesson. During class, the teacher's recorder was not visible, so students would be minimally distracted by the device.

The analysis of interaction needed a constant interpretation of the meaning making and interpretation process of those involved. I therefore complemented my collection of data of verbal student and teacher interaction with aspects of the context that were relevant to the meaning making process of the students. I was present in every lesson as a non-participant observer. I usually sat in the back of the class, observing not only the research situation but also the context of the situation. I made notes on events that took place during class, the role of the teacher and the behavior of the students, all that could be relevant to my study. In my notes, I included a drawing of what and how the teacher wrote on the blackboard. In addition, I made preliminary interpretations and used the observations in a first round of analysis of the data and the context in which it appeared.

I added to my data collection by collecting the written tasks the students had worked on and the answers students had written down in seatwork. Written tasks, if present, were gathered by copying them after class. Hand written answers were gathered the same way. In addition to text and work books, I copied all booklets and handouts, and I asked participants to e-mail any digital materials they might have used. Finally I interviewed both students and teachers with respect to their ideas and views on interaction and seatwork in the classroom, using open unstructured interviews, guided only by a few general topics formulated in advance. Before the interviews, participants were asked for their permission to record the conversation.

3.5 Analysis

A total of 323 school hours of verbal interactional data were ultimately recorded. Based on criteria that differed per study, as detailed in Chapters 5 to 7, a selection of this data was made. The selected recordings were transcribed using Express Scribe, a freeware transcription program, into the format proposed by Mazeland (2003) based on the format for conversation transcription created by Jefferson (1984). This format includes an abundant system for intonation (Jefferson, 1984; Mazeland, 2003). However, for reasons of time and efficiency, I only transcribed intonation when it influenced the meaning of the words uttered. When students for instance stressed certain words to add a certain affective load, this was indicated with an underlining of the words in question: 'But I said it was two third.' Utterances were transcribed using standard punctuation to represent the grammatical organization of the utterances as I interpreted them.

Longer pauses in interaction were represented as (1.12), in which [1.] represents the number of minutes, and [12] represents the number of seconds the pause took. Pauses shorter than three seconds were represented with (.). In transcribing the recordings, I made use of the complementary data that were collected to understand the words students uttered to each other. When words were inaudible, they were represented in the transcript as: (inaudible). Speakers were represented with the first initial of their aliases, see for instance Transcript 3.1 in which Jane (J:) and Mike (M:) conduct a conversation. The teacher was generally indicated with (T:). Real names were never used.

I analyzed the transcribed interactions applying a mixed method approach proposed by Mercer (2004), which he referred to as 'sociocultural discourse analysis'. Mercer (2004) chose this concept to distinguish this approach from the term 'discourse analysis', which is used to refer to several different approaches to analyzing spoken and written language, and to quite different methods, depending on the scientific area it is used in. 'Sociocultural discourse analysis' is less focused on language itself and more on its functions for the pursuit of joint intellectual activity, which is exactly what my study aimed to do. This approach is comparable to linguistic ethnography and conversation analysis. However, unlike much ethnographic research 'sociocultural discourse analysis' incorporates a concern with the lexical content and the cohesive structure of talk, especially across the contributions of individual speakers, because, according to Mercer (2004) word choices and cohesive patterning can represent ways that knowledge is being jointly constructed. The methodology differs from conversation analysis because cognition and the social and cultural context of talk are considered legitimate concerns (Mercer, 2004). Mercer (2004) proposed to combine this qualitative approach with a quantitative approach in analyzing interaction, for instance with a coding scheme approach in which utterances are allocated to pre-defined categories, or other methods which involve measuring the relative frequencies of occurrence of particular words or patterns of language use. In this study I have chosen to combine Mercer's qualitative approach with systematic observation by using a coding scheme. This resulted in a combined approach of frequencies of occurrence and numerical comparisons to provide a general overview on the nature of student interaction and a qualitative

analysis of the discourse to describe the way students used language in verbally constructing knowledge.

In analyzing my transcribed data, I first divided all student interaction in seatwork into analyzable units. The analyzable units I used were both smaller and larger segments, respectively called 'units of meaning' (cf. Rozenszayn & Assaraf, 2011) and 'episodes' (Nassaji & Wells, 2000). The largest unit was the 'episode', which consisted of all the talk produced in carrying out a single activity. Episodes were topically distinguished. In practice they usually consisted of a small scale discussion about one particular school task or a subsection of a school task. Transcript 3.1 shows an example of an episode. Two students, Jane and Mike, start working on a part of the task they have to complete:

J: C
M: (reads out loud) …information of section 2.4
J: What?
M: You have to use section 2.4. What does this say about life and death of the Aztecs?
(.)
M: I'll look at source 17 and 18
J: Where is section 2.4?
M: In the beginning, chapter 2, page 4
(0.12)

Transcript 3.1: History – Jane and Mike

The episode starts when Jane signals the subtask she starts working on, by stating: 'C'. Mike adds to this, by reading the formulation of the task out loud. In this short episode students divide the work they have to do and establish where the sources they need can be found. The episode ends quite abruptly, with a twelve second silence, after which students start discussing their feelings towards these tasks. The silence in combination with the topic change indicates the end of the episode in my analysis.

Episodes were divided into smaller units of analysis, so called 'units of meaning'. A unit of meaning is a verbal unit that contains only one message, i.e. a series of words with a single idea (Rozenszayn & Assaraf, 2011). For instance, a complete utterance like: 'What? I don't know how I should answer this question. Wait, I'll look it up.' consists of two units of meaning. One in which the student expresses his problem with the task 'What? I don't know how I should answer this question.' And one in which he expresses a way to a possible solution: 'Wait, I'll look it up.'

After distinguishing both episodes and units of meaning, units of meaning were coded using a code system, based on an analytical framework consisting of several functions of language. I intended to make a distinction between categories of interaction that reflected different degrees and different types of interaction and verbal construction of knowledge. I therefore constructed an analytical framework containing categories that describe the different functions language had in student interaction, i.e. a social, an instrumental, a pedagogical and an exploratory function. The analytical framework was constructed using a thematic analysis approach, as proposed by

Boyatzis (1998). Its construction was based both on the results of prior research on student interaction in the classroom and fine-tuned using student interactions in my dataset. The analytical framework was constructed in a process of going back and forth between data and theory. The construction of this analytical framework is discussed in detail in Chapter 4.

The units of meaning were categorized using the functions of language of the analytical framework I constructed. After this, the occurrence of each function of language was counted and presented in summary statistics. These summary statistics provided a first insight into the way students interact in seatwork. The summary statistics were complemented with Mercer's (2004) qualitative approach to describe the nature of the interaction within the episodes.

I furthermore interpreted the interaction of the students in relation to the way they verbally constructed knowledge. To understand how students verbally constructed knowledge I first distinguished episodes in which this phenomenon played a pronounced role, using the framework. In addition, I studied episodes in which a conflict of perspectives arose, since these were considered fertile ground for the verbal construction of knowledge (Bakhtin, 1981; Nystrand & Gamoran, 1997; Nystrand *et al*., 1997a). These episodes I analyzed using again Mercer's (2004) qualitative approach. I interpreted the units of meaning in these episodes, using the context of each unit of meaning, which consisted of the nature of the school, the classroom, the teacher and the tasks students were working on to make sense of the way students interacted with each other. For this, I used the complementary data I collected consisting of observational notes, interviews and written material. I furthermore took into account the lexical content and the cohesive structure of talk, especially across the contributions of individual speakers, because, according to Mercer (2004) these can represent ways in which knowledge is being jointly constructed.

3.6 Outline of my exploration

My exploration into the nature of verbal student interaction and the way student verbally constructed knowledge in seatwork consisted of both the construction of an analytical framework and the conducting of three separate studies on student interaction in seatwork. I started this research project with a theory-based construction of an analytical framework with which I could describe not only the nature of verbal student interaction in seatwork, but also the way students construct knowledge within their interaction. I based this analytical framework on literature regarding learning in classroom interaction. Combining the results of different studies on the matter (Atwood *et al*., 2010; Chinn *et al*., 2001; Mercer *et al*., 1999; Nystrand & Gamoran, 1997; Webb *et al*., 2009a), I constructed a first draft of the analytical framework. Although the literature on the subject was abundant and thorough, its results were not directly applicable to the situation of seatwork. I therefore needed to fine tune my theory-based analytical framework to the everyday practice of seatwork.

Both to reach this aim and to start my inquiry, I collected my first data on student interaction in classroom situations in which students were set to work individually on textbook tasks, but in which they were offered the opportunity to interact. A part of the data I thus obtained functioned as a point of reference to test the usability of my analytical framework and to fine tune the analytical framework to fit seatwork. Chapter 4 reports on the construction of the analytical framework. The complete collection of the obtained data was studied to find an answer to the first question: 'How do students verbally interact with each other in seatwork?'. Chapter 5 reports on the results of this first study.

Based on the findings in my first study on the way students verbally constructed knowledge in seatwork and the factors that influenced this, I decided to continue my inquiry in a different situation. In my second study, both the task and the work-setting were designed to facilitate students' learning. This second naturalistic study was guided by the question: 'What aspects of teacher and task instruction influence students' language use in collaborative learning as compared to seatwork?'. Chapter 6 reports on this second study.

Based on the factors that influenced students' verbal construction of knowledge, derived from both the first and the second study, I designed an approach for the third study. This study was experimental in nature, to discover whether the verbal construction of knowledge in student interaction in seatwork could be stimulated. The central question to this study was: 'Does changing the teacher instruction to one containing more content-related and exploratory functions of language, result in student interaction with more content-related and exploratory functions of language when working independently on textbook tasks?' Chapter 7 reports on this third study. In Chapter 8 finally, I answer the questions posed in this study and I discuss them.

CHAPTER 4

Constructing an analytical framework

4.1 Introduction

In order to explore how students used language in their interaction in seatwork, an analytical framework was needed. Other studies into student interaction have produced categories with which knowledge construction in interaction can be described (cf. Atwood *et al*., 2010; Mercer, 2008b; Van Boxtel & Roelofs, 2001). The way students work together is found to relate to the quality of their interaction (Atwood *et al*., 2010; Mercer, 1995, 2008; Van Boxtel & Roelofs, 2001; Wells & Arauz, 2006). The descriptive categories distinguished in these studies were therefore often rooted in the level of collaboration that students displayed. Mercer's (2008) disputational, cumulative and exploratory talk, for instance, are categories that relate the nature of student collaboration to the level of verbal knowledge construction.

Although these categories are invaluable, they only describe student interaction in terms of knowledge construction. In my exploration into student interaction in seatwork, I aimed to not only describe if and how students constructed knowledge, but also aimed to describe interaction that could perhaps be considered less productive for knowledge construction.

This chapter reports on the construction of an analytical framework with which all student interaction in seatwork can be described and analyzed. The chapter starts with a discussion of the design that was used to construct the analytical framework in Section 4.2. The theoretical foundation of the analytical framework is presented in 4.3. Since student interaction in seatwork has not often been the subject of study, the analytical framework is founded on studies into student interaction in different situations. Section 4.4 reports on the outcomes of the application of the analytical framework to four student interactions in seatwork, to test its use and to refine the analytical framework if necessary. The final version of the analytical framework is presented in Section 4.5.

4.2 Design

The analytical framework was constructed according to Boyatzis' (1998) proposal for thematic analysis and was based on a prior research driven approach. The categories

that constituted the analytical framework were based on a distinction in functions of language (Mercer *et al*., 1999). I used other studies into verbal student interaction in the classroom (cf. Atwood *et al*., 2010; Chinn *et al*., 2001; Mercer *et al*., 1999; Nystrand & Gamoran, 1997; Webb *et al*., 2009a) to attribute defining characteristics to these functions and, more importantly, to distinguish interactional patterns and word use that signal the occurrence of these functions in student interaction. Although most of these studies focused on student interaction in situations other than seatwork, they were conducted in an educational context. Linguistic characteristics from studies into these situations could therefore most probably also apply to interaction in seatwork. The combination of the functions of language with the results of other studies on language in the classroom led to a theory driven analytical framework.

To test whether the theoretically constructed functions of language could be used to describe student interaction in seatwork, they were used in a pilot study to analyze a selection of the data derived from the first study. These data consisted of four recordings of student interaction in seatwork in four different lessons, being History, Biology, English (as a foreign language) and Economics. As a result of this pilot study, additions and adjustments were made to the analytical framework. The pilot study furthermore resulted into positive and negative examples of the occurrence of functions of language, which could be used to eliminate possible confusion when looking for the functions in student interaction. The analytical framework thus constructed was usable, but not yet finished. The use of the analytical framework in both the second and the third study in my research led to further additions and adjustments and to additional examples, as discussed in Chapters 5 to 7.

4.3 Constructing an analytical framework

4.3.1 Functions of language

Gee (1999) argued that language serves a great many functions in peoples lives. It not only allows people to give and get information, but also allows them to do things and to be things in relation with others. Language can even have multiple functions at the same time: People may use language to exchange meaning, construct relationships and construct knowledge, all in one single utterance.

In constructing an analytical framework for analyzing student interaction in seatwork, I searched for categories which could do justice to these different functions of language. I found these categories in Mercer, Wegerif and Dawes (1999), who distinguished three functions of language. Together, these functions are argued to shape individual cognition (Mercer *et al*., 1999). Separately, these functions represent a distinction that can be used to describe not only interaction in which knowledge is verbally constructed but also other forms of interaction. The functions of language can be considered a metaphor with which the complex processes that come into play when the use of language affects individual cognition can be perceived and understood. Although these functions are meant as a metaphor for understanding, the notion of

different language functions forms an interesting perspective on interaction. Since my study aimed to understand how language is *used* in seatwork, so in essence how language functions come into play when students interact in seatwork, a distinction in these functions of language forms a promising starting point of my analytical framework.

The first function Mercer *et al*. (1999) distinguished was language as a social tool, *a social function of language*. This function can be interpreted as language used to share meanings between people and to establish relationships. The second function Mercer *et al*. (1999) distinguished was language as a pedagogical tool, *a pedagogical function of language*. This function can be interpreted as language use to seek and provide intellectual guidance. The third function they distinguished was language as a cognitive tool, *a cognitive function of language*. This function could be interpreted as language used to process knowledge.

These functions can be perceived as integrated, meaning that every utterance can contain more than one function at the same time. An utterance, or unit of meaning (cf. Chapter 3), like 'I finished my homework yesterday' essentially functions as the exchange of meaning between two or more people. In this case the meaning that the speaker claims to have performed a certain action which he calls 'homework', the day before the day he uttered this unit of meaning. Both the context and the interpretation of the participants determine what other functions this unit of meaning has. Between two students the utterance 'I finished my homework yesterday' can be part of the construction of identities, of being two students with the same tasks and responsibilities. However, in a conversation with a teacher, this unit of meaning could emphasize the hierarchy between the two conversants. This unit of meaning could be part of the construction of a discourse community of school, in which a student renders responsibility for his actions to a teacher.

The unit of meaning 'I finished my homework yesterday' can construct knowledge and values that belong to a certain discourse community. In a school setting or a in the discourse community of the school, the knowledge constructed by this utterance can be knowledge on how to act. In the case of two students this could be knowledge on when homework has to be made: 'in advance'. The values constructed are values concerning what is common practice in the community of the school. The value constructed by this unit of meaning, could be the value that it is a good thing to make homework in advance, or perhaps the value that homework should not be made too far in advance, the day before the due date is early enough.

The unit of meaning is also to a certain degree part of the guidance of another person into certain knowledge. The utterance 'I finished my homework yesterday' could guide a student into the knowledge of the community of the classroom, in which homework is an important phenomenon. Homework in general contains tasks that concern some degree of learning and that have to be fulfilled in advance of a certain meeting, i.e. class. This unit of meaning could implicitly contain this information, depending on the context, and could thus be used to guide someone else into this particular knowledge system. All units of meaning may contain all functions of language in interaction at the same time; They can be at the same time a means to communicate,

to create and maintain social relations, to seek and provide guidance, and a means to construct knowledge.

In using the functions of language as analytical categories, I worked from the assumption that one function is dominant in all utterances. The utterance 'I finished my homework yesterday', may contain all functions, however, the context and the interpretation of the participants determine what function of language is dominant in that particular unit of meaning: confirming a relationship, constructing knowledge or guiding another into certain knowledge or values. Although these functions of language form a promising way of describing student interaction in seatwork, as analytical categories they lack distinctive characteristics. In the next section, I will combine the functions of language with characteristics derived from other studies into classroom interaction.

4.3.2 Distinctive characteristics the functions of language

Studies into classroom interaction have to a certain degree discussed and defined several functions of language. Although these studies all labeled their categories of talk differently, they have distinguished interactional characteristics for functions comparable to the cognitive and pedagogical function. I describe the interactional characteristics of these functions of language on several levels.

First I describe the characteristics of the functions of language concerning the interpersonal actions and intentions. These can be defined as the general attitude that students display when interacting with each other, for instance how students treat the contributions of other students (Atwood *et al*., 2010; Mercer, 2008), how they are engaged with the task they work on (Heath, 1983; Nystrand, 1997b) and how they deal with conflicting situations (Bakhtin, 1981; Kumpulainen & Mutanen, 2000; Nystrand, 1997b).

Secondly I describe the characteristics of the functions of language concerning interactional patterns. The way the interaction 'flows' tells us something about how language is used. Whether contributions by participants are relatively long or short (Mercer, 1995, 2008) or whether the interaction has a fluid or a choppy nature (Atwood *et al*., 2010; Nystrand, 1997b), tells something about the role the verbal construction of knowledge plays in interaction. The fluidity of an interaction can be perceived by the number of topics used and the way topics changes occur – naturally or abrupt.

Thirdly I describe the characteristics of the functions of language concerning speech acts. Studies have distinguished a number of speech acts that are characteristic for the occurrence of certain functions of language, for instance for language used to construct knowledge (Atwood *et al*., 2010; Mercer, 2008).

I start by discussing the characteristics of the cognitive function of language, followed the pedagogical and the social function of language. All discussed characteristics were collected in Table 4.1, which represented the first draft of the analytical framework.

Cognitive function

Most studies into classroom interaction discuss language as a means to construct knowledge. This style or mode of interaction, as it is usually considered, has been given different names in different studies. Their names differ from 'discursive interaction' (Edwards & Westgate, 1994), 'the cognitive category' (Rozenszayn & Assaraf, 2011) and 'dialogic inquiry' (Wells, 1999), to 'exploratory interaction' (Atwood *et al*., 2010; Cazden & Beck, 2003; Mercer, 1995, 2008). All these concepts refer to a function of language for the construction of knowledge in interaction (Mercer, 2008).

The term 'cognitive' in general has been given many different definitions in different subject areas. Most differ a great deal from the way the term is used in my preliminary analytical framework. To avoid confusion, I replaced 'cognitive' with a concept which is closer in meaning to the notion 'verbal construction of knowledge' and is used as such by others, like Mercer (1995, 2008b): 'exploratory'. The concept 'exploratory' refers to the discovery of new things, which is exactly what this function describes. The exploratory function of language can be defined as language used for the transformation of understandings (Nystrand *et al*., 1997a).

According to studies into classroom interaction, there are certain interactional characteristics by which the dominance of the exploratory function of language can be recognized in student interaction. Mercer (2008b) described students' attitude as open towards each other. Students display interaction in which the views of all participants are sought and required, and in which the participants contribute equally, as Mercer (1995, 2008b) argued. "The participants are receptive to well-argued proposals, exploratory initiations receive uptake, themes emerge and continue, explanations are offered, accepted and revisited, understandings are consolidated" (Mercer, 1995, p. 68). The airing of diverse perspectives acts as a collective resource for the interaction, and conflicting perspectives are clarified in interaction (Kumpulainen & Mutanen, 2000). These conflicting perspectives are considered a valued source for the construction of knowledge, instead of a breach with the knowledge that is considered correct (Bakhtin, 1981; Nystrand, 1997b).

Characteristic for the exploratory function of language are long conversational turns, because of the argumentations and elaborations used. Atwood *et al*. (2010) described that when language is used for constructing knowledge in interaction, proposed meanings receive uptake, which results in interaction that has a fluid character, instead of being choppy (Atwood *et al*., 2010; Nystrand, 1997b). The contributions furthermore are in coordination with each other (Engle & Conant, 2002).

Speech acts that indicate that language is used for the verbal construction of knowledge are challenges, counterchallenges and requests for clarification (Mercer, 1995). Britton (1974) added the speech act of hypothesizing, which he describes as the most clear form of verbal reasoning because of the innovative combining of concepts. Krol (2004) emphasized the importance of the presence of explanations and elaborations, since both speech acts indicate argumentative structures and again combinations of concepts. Wegerif and Mercer (1997) and Wittrock (1991) stipulated the importance of giving arguments, justifying and comparing. Brown and Renshaw (2000) distinguished a number of key words, which when used result in interactions

that contained more conversational turns and explanations: represent, compare, explain, justify, agree and validate.

Pedagogical function

The pedagogical function of language in classroom interaction has been the focus of studies into both teacher-student interaction and cooperative learning. These can be considered situations in which knowledge is not constructed between people who contribute as equals to the interaction, as is the case in the exploratory function of language in interaction, but between a student and someone more knowledgeable, like a teacher or a more knowledgeable peer. The function of language can be defined as language used for providing and seeking intellectual guidance (Mercer *et al*., 1999).

The pedagogical function of language can be recognized in interaction by a hierarchical difference in the social roles that the participants assume, since one person knows more than the other. These roles do not necessarily have to be fixed: especially in student interaction the roles may change with every topic shift. Wright (1982) characterizes the relationship, despite the power or knowledge imbalance, as cooperative, defined by reciprocity, discussion, mutual respect and by attempts to coordinate one's own views with those of others (Atwood *et al*., 2010; Wright, 1982). Because cooperative relations involve mutual respect, such relations are also characterized by a positive emotional climate of "mutual sympathy and affection" (Wright, 1982, p. 216).

Nelson-Le Gall (1992) divides language used for guidance into two interpersonal actions: help seeking and help giving. Not only the help seeker learns through the use of the pedagogical function of language, the help giver also constructs knowledge: By rephrasing and clarifying the subject material, he acquires a deeper understanding of the material. He may also discover gaps in his knowledge and may recognize that his knowledge not always matches the knowledge of others (Webb & Farivar, 1999). The verbal production and combining of concepts forces the help giver to think and rethink certain concepts, to reorganize and clarify material, to recognize misconceptions, to fill in gaps in her own understanding, to internalize and acquire new strategies and knowledge, and to develop new perspectives and understandings (Webb *et al*., 2009b). The social setting triggers this process: The fact that a person assumes the role of help giver, forced or voluntary, creates a situation in which the help giver is expected to know more, which opens the possibility of learning through helping.

Nelson-Le Gall (1992) made a distinction between two kinds of help seeking: instrumental help seeking and executive help seeking. The term instrumental help seeking refers to the help a student seeks to reach his goal, for instance to learn something or to be able to complete a certain task. The term executive help seeking refers to help seeking in which it is the students' intention to have someone else solve a problem on his behalf. Only the first kind of help seeking is a characteristic interpersonal action belonging to the dominance of the pedagogical function, because only this type of help seeking refers to the need of intellectual guidance.

The speech acts that characterize the pedagogical function are questions and counter questions (Nelson-Le Gall, 1992). Krol *et al*. (2004) distinguished elaborations and explanations; Webb and Farivar (1999, 2009) emphasized the use of argumentations, explanations and requests for clarification. Other speech acts distinguished are providing reasons and evidence for and against positions, challenging others with counter-arguments, weighing reasons and evidence (Chinn *et al*., 2001; Reznitskaya *et al*., 2007). Web *et al*. (2009) also added elements of Mercer's exploratory talk as characteristic for a pedagogical function of language: Justifying one's own ideas, challenging each others' ideas, and negotiating alternative ideas (Mercer, 2008). As can be seen, the speech acts characteristics of the dominance of the pedagogical function of language do to some degree overlap with the speech acts of the exploratory function of language. The difference between these two functions is expressed in the difference in interpersonal actions.

Social function

The social function of language is defined as language used to exchange meaning in constructing social relationships. In student interaction this function has many appearances, for there are many kinds of social relations. When the social relations constructed are of a personal nature, the occurrence of this function of language is in most studies not discussed any further. Studies into classroom interaction tend to disregard episodes in which students for instance discussed their weekend. In some studies its occurrence is mentioned in a single sentence, as in Rozenszayn and Assaraf (2011, p. 134): "(…) students tended to discuss social matters when left alone". In some studies the occurrence of this use of language was just labeled as off-task behavior (Anderson, 1984).

The social function of language can however also apply to the work-setting. For instance in Mercer's cumulative talk a predominantly peaceable relationship resulted in students avoiding conflict which inhibited any form of verbal knowledge construction. In his disputational talk an extreme argumentative relationship resulted in seeking conflict without any openness to arguments, with the same affect. Nelson-Le Gall's (1992) notion of executive help seeking can also be regarded as an appearance of the social function: Students use language to get a peer to do something for them, which Nelson-Le Gall (1992) regards as a form of help seeking that does not stimulate learning. The social function is dominant in this type of help seeking, rather than the pedagogical function.

Conversants exchange meaning to share feelings, events and knowledge, thus aiming to create a shared sense of relation – whether this relationship is one of mutual understanding or one of individualism and competition (cf. Mercer, 2008b). Language use can be characterized as the exchange of meaning, without visibly altering this meaning in interaction (Mercer, 1995). The interaction takes the shape of fact sharing and of articulation (Scott *et al*., 2006). The length of the utterances may vary, from very short statements to stories that take hours to tell. In the classroom this latter situation will however seldom occur in student interaction. The speech acts from which the use of this function of language can be recognized are asking and answering, concerning

attempting to get someone to do something (Nelson-Le Gall, 1992). Mercer (1995) distinguished repetitions, confirmations, assertions and counter-assertions.

4.3.3 Analytical framework and instrument

Table 4.1 shows the three functions of language and their definitions. The characteristic interpersonal actions, interactional patterns and speech acts are collected and represented.

Table 4.1: Analytical framework for the description and analysis of verbal student interaction, version 1

	Social function Language used to exchange meaning in constructing social relationships	**Pedagogical function** Language used providing and seeking intellectual guidance	**Exploratory function** Language used for the transformation of understandings
Interpersonal actions and intentions	– Creating a shared sense of relation (Mercer, 1995) – Off-task behavior (Anderson, 1984) – When on-task: nature of relation hinders learning, by being constraining or too peaceable (Mercer, 2008) – Relation focuses on coordinating action (Nelson-Le Gall, 1992)	– Hierarchical relation (Nelson-Le Gall, 1992) – Mutual sympathy and affection (Wright, 1982) – Cooperative relationship, defined by reciprocity, discussion, mutual respect and by attempts to co-ordinate one's own views with those of others (Atwood *et al*., 2010) – Instrumental help seeking (Nelson-Le Gall, 1992) – Instrumental help giving (Nelson-Le Gall, 1992)	– Open attitude (Mercer, 1995) – Explorations receive uptake (Mercer, 1995) – Participants are equal contributors to the conversation (Mercer, 1995) – Solving of conflicts (Wittrock, 1991) – Airing of diverse perspectives - a collective resource for the interaction (Kumpulainen & Mutanen, 2000) – Conflicting perspectives are clarified in interaction (Kumpulainen & Mutanen, 2000) – Conflicting perspectives are considered a valued source for the construction of knowledge, instead of a breach with the knowledge that is considered correct (Bakhtin, 1981; Nystrand, 1997b)

Interactional patterns	– Exchanging meaning (Mercer, 1995) – Fact sharing and articulation (Scott *et al.*, 2006) – Short and longer exchanges – Choppy interaction (Atwood *et al.*, 2010)	– Gaps in knowledge are recognized (Webb & Farivar, 1999) – Subject material is rephrased and clarified (Webb & Farivar, 1999) – Concepts are reorganized and clarified, misconceptions are recognized (Webb *et al.*, 2009)	– Questions are discussed (Mercer, 1995) – Answers are hypothesized – Long turns – Fluid interaction (Atwood *et al.*, 2010) – Exploratory utterances receive uptake (Atwood *et al.*, 2010) – The contributions are in coordination with each other (Engle & Conant, 2002)
Speech acts	– Asking (Nelson-Le Gall, 1992) – Answering (Nelson-Le Gall, 1992) – Asserting (Mercer, 1995) – Counter asserting (Mercer, 1995) – Repetitions (Mercer, 1995) – Confirmations (Mercer, 1995) – Articulating (Scott *et al.*, 2006)	– Questions (Nelson-Le Gall, 1992) – Counter questions (Nelson-Le Gall, 1992) – Explanations (Krol *et al.*, 2004) – Elaborations (Krol *et al.*, 2004) – Clarifications (Webb & Farivar, 1999) – Argumentations, explanations and request for clarification (Webb & Farivar, 1999; Webb *et al.*, 2009) – Providing reasons and evidence for and against positions – Challenging others with counter-arguments – Weighing reasons and evidence (Chinn, Anderson & Waggoner, 2001; Reznitskaya, Anderson & Kuo, 2007) – Justifying ideas and challenges of each others' idea's (Mercer, 2008b; Webb *et al.*, 2009) – Negotiating alternative ideas (Mercer, 2008b; Webb *et al.*, 2009)	– Challenging (Mercer, 1995) – Counter challenging (Mercer, 1995) – Requesting clarification (Mercer, 1995) – Comparing (Wittrock, 1991) – Explaning (Krol *et al.*, 2004) – Elaborating (Krol *et al.*, 2004) – Hypothesizing (Britton, 1971; Wegerif & Mercer, 1997) – Argumenting (Wegerif & Mercer, 1997) – Justifiying (Wegerif & Mercer, 1997) – Representing, comparing, explaining, agreeing and validating (Brown & Renshaw, 2000)

Figure 4.1 shows how I used the characteristics collected in Table 4.1 to define the functions of language. For every unit of meaning I determined what speech act it realized, what type of interactional pattern the surrounding units of meaning in the episode showed and what type of interpersonal relations could be distinguished, by taking into account the episode from which the unit of meaning came. This procedure led to the determination of the dominant function of language in units of meaning.

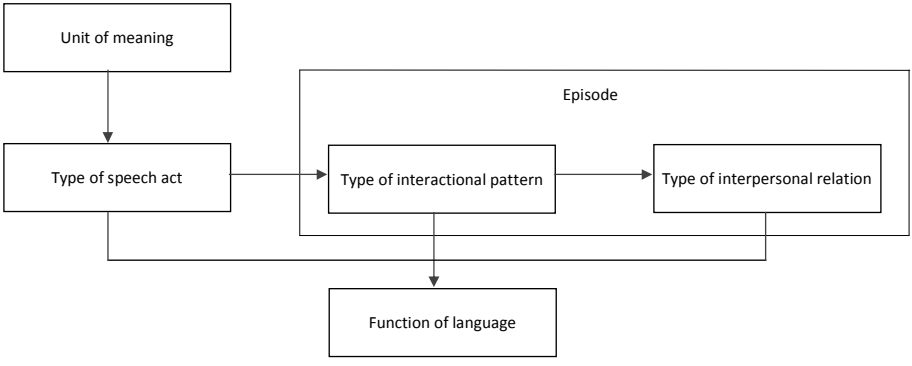

Figure 4.1: Applying the analytical framework step by step

4.4 Piloting the analytical framework

4.4.1 Research design

The analytical framework was tested in a pilot study. The primary aim of this pilot study was to determine the usability of the analytical framework. The data used in this pilot study consisted of the recorded verbal interactions of four student dyads, who worked independently on textbook tasks in four lessons each about a different school subject: History, Economics, Science and English. I chose different school subjects to find out whether the analytical framework could be used to describe student interaction on different subject content.

The tasks the students worked on were textbook tasks with an individual character, typically used in seatwork in the Netherlands (Bonset & Rijlaarsdam, 2004). The tasks consisted of rather closed questions requiring an answer that was either right or wrong. To find the right answer, students had to use a simple form of reasoning (Chinn & Malhotra, 2002; Mayer, 1998). The answer could be found by analyzing, combining or calculating data. Students were asked to work independently, but were allowed and to some degree even stimulated to interact during their work. Students were for instance implicitly expected to discuss problems with their partner first before consulting the teacher, as interviews with both teachers and students indicated. To prepare the recordings for analysis, they were transcribed as discussed in Chapter 2, and were divided into units of meaning. These units of meaning were categorized into functions

of language, using the characteristics of the analytical framework (see also Chapter 3). In order for the analytical framework to be fully functional, the functions of language would have to be applicable to all units of meaning in student interaction, leaving no unit of meaning uncategorizable. In addition, the functions of language would have to be distinctive. Applying the functions of language to the units of meaning would have to result in a clear description of the units of meaning.

Table 4.2 shows the characteristics of the data concerning subject, student gender, available working time in minutes and the type of task. In the following section the results of the analysis are presented, the analytical framework is adjusted and refined and examples that help distinguish the functions of language are provided.

Table 4.2: An overview of the data

Subject	Available working time	Gender of dyads	Type of task
Economy	28:04	Male – Female	Calculation-task
Biology	31:37	Male – Male	Defining concepts
English	14:39	Female – Female	Completion exercise
History	18:32	Female – Female	Finding arguments in a text

4.4.2 Results

After analyzing the units of meaning in terms of functions of language, it appeared that the analytical framework could indeed be used to describe all units of meaning. There were however a few notable results. Table 4.3 shows the division of units of meaning in functions of language per recorded conversation in percentages of the total sum of units of meaning per lesson. N represents the number of units of meaning of one dyad per lesson and in sum of all dyads.

Tabel 4.3: Percentages of function of language per dyad per lesson

	Biology N=389	Economics N=478	English N=133	History N=207	Sum N=1207
Exploratory	3.0	1.5	0.2	6.0	3.0
Pedagogical	0.5	2.5	–	–	1.0
Social	96.5	96.0	99.8	94.0	96.0

All units of meaning could be categorized as utterances in which a certain function of language was dominant. However, such a large percentage of units of meaning could be characterized as showing mainly the social function of language, that the function hardly discriminated. The definition of the social function appeared to be too broad to be useful as a category for the analysis of student interaction in seatwork. Further distinction was necessary. To create this distinction I took a closer look at the units of meaning characterized in terms of the social function of language, which will be discussed in the next section.

4.4.3 Splitting the social function of language

In rereading and reanalyzing the units of meaning characterized as showing mainly the social function of language, it appeared that language was used in two manners. First, language was used to create and maintain social relationships with a peer. Second, language was used to exchange meaning in order to complete the task. This second use was so fundamentally different from the first, that it was defined as a separate function: the instrumental function of language.

Transcript 4.1 shows the use of the social function of language to construct and maintain a social relationship. Nikki and Marlou discussed at what time their free time jobs started.

N: What time are you through?
M: Three o clock
N: Oh and you start work at half past three?
M: Yes. What time do you start?
N: Yes also half past three

Transcript 4.1: History – Marlou and Nikki

This transcript shows three question-answer sequences, which can be characterized as short exchanges of meaning without argumentations or explanation. Students share facts. Marlou and Nikki shared information about at what time their school day ended and at what time their after-school jobs started. The dominant function of the units of meaning in this transcript was social. By sharing these facts students constructed a social relation between them, of being two students with after school responsibilities. Although this transcript was derived from student interaction in seatwork, this social episode had no direct connection to the task the students worked on.

The following two transcripts show episodes in which the new function of language was used, i.e. language used as an instrument to complete the task. Transcript 4.2 shows this function to answer the questions posed in the task. Karel and Titus were discussing the meaning of the Latin names for animals mentioned in the task and whether these animals' natural habitat would be in the Netherlands. In this transcript the students discussed the term 'Elephans Maximus'. They used a computer to find the answer on the Internet.

K: Elephans Maximus is an Asian elephant
T: Asi-an e-le-phant (writing down)
K: He doesn't live in the Netherlands
T: Yes he does
K: Yes in the zoo

Transcript 4.2: Biology – Titus and Karel

Karel started by articulating the Latin term that had to be defined and the definition he found: Asian elephant. Titus answered by writing the answer down out loud, implicitly accepting the answer. After Titus' reaction, Karel answered the second part of the question posed in the task by stating that the elephant did not live in the Netherlands. In this case Titus objected, by counter stating that the elephant did live in the Netherlands. Karel answered by uttering another statement, emphasizing the word 'zoo', implying that the zoo was no natural habitat, and would therefore not make a valid answer to the question.

In this episode students shared facts they found on the Internet to define the Latin term, and shared facts they already possessed to answer whether the animal's natural habitat was in the Netherlands. They used no argumentation, hypothesizing or verbal reasoning. Instead they used assertions and counter-assertions. Meaning was exchanged, not negotiated in interaction. The function of language used in interaction was therefore initially characterized as social.

A social relationship was indeed constructed within these units of meaning: a somewhat disputable one (cf. Mercer, 2008) in which Karel appropriated the role of answer giver, disregarding Titus' counter-assertion, which could be interpreted as an attempt to joke about the elephants natural habitat. The creation of a social relationship however did not seem to be the dominant function of these units of meaning. The students in this episode predominantly used language as an instrument to arrive at an answer to the question posed in the task.

Transcript 4.3 shows an episode in which students used language to clarify the end and means of the task. Students exchanged meaning concerning the task, in order to find out what task they had to work on exactly: task number 18 or subtasks A, B and C.

M: What do we have to do? This or A, B and C?
N: I don't know . This is A, but then, where is B?
M: I think we have to write this down
(points at a task)
N: Okay

Transcript 4.3: History – Marlou and Nikki

Students Marlou and Nikki discussed the task they had to work on, to clarify what the task exactly aimed at. The units of meaning in this transcript were initially characterized as the social function of language in interaction, since they could be regarded as an exchange of meaning on what the students are expected to do, i.e. to construct a common goal and thus a social relationship. The potential reasoning of Nikki ('This is A, but then, where is B?') received no uptake, but was treated by Marlou as a unit of meaning that merely indicated an expression of ignorance concerning the proper procedure. Marlou ended with a form of reasoning in 'I *think* you have to write this down', however, Nikki accepted it as an assertion, rather than a form of reasoning, and agreed. The exchange of meaning had the character of fact sharing, not of joint reasoning made explicit. Students did not use arguments or elaborations. They told

each other what they saw and what they thought, without making inferences or taking up on each others' potential forms of reasoning.

Although the students did construct a common goal, and with that constructed a relationship, it was not the dominant function of the language they used. The students predominantly clarified what they had to do in order to be able to work on the task. They predominantly used language as an instrument to create the conditions that would enable them to do what they were told.

4.4.4 The instrumental function of language

The previous three transcripts showed episodes of the social and the instrumental function. In the first transcript, the social function of language in interaction primarily constructed a social relationship between the two students. In the last two transcripts however language was predominantly used as an instrument to establish something, which could be distinguished as completing the task or verbally creating the necessary conditions for doing so. As Mercer (1995, p. 67) argues: "[…] in classroom talk, as in other kinds of conversation, people use language to pursue their interests and goals. They want to get somewhere, and their conversations are vehicles for doing so." In the instrumental function of language 'getting somewhere' is the dominant aim.

Some of the collected characteristics mentioned in Section 4.3.2 need to be rearranged, for in retrospect, they seem better suited as description characteristics of this fourth function. The characteristics of executive help seeking for instance, as distinguished by Nelson-Le Gall (1992), and the characteristics of disputational and cumulative interaction, as distinguished by Mercer (2008), are both forms of student interaction in which the social function plays a role, but in which language is primarily used as an instrument for completing the task. An observation that can be made regarding the instrumental function of language is the conversational topic it concerns. Since the instrumental function of language can be defined as language used as an instrument to pursue a goal, in seatwork this 'goal' could be defined as the task that students work on. A distinctive characteristic of the instrumental function of language could therefore be found in the conversational topic: the task.

The characteristic interpersonal actions and intentions of the instrumental function can be defined as students pursuing an aim. In the case of student interaction in seatwork this aim often entails completing the task. In completing a task, students do not necessarily need to reason or hypothesize. The interactional patterns of this function are characterized by short turns and little argumentation, without explicit joint reasoning. The sharing of facts does not call for verbally explicit cognitive restructuring (Krol *et al*., 2004). The speech acts used in this function of language are quite similar to the speech acts used in the social function of language: questions, answers, statements, assertions and counter assertions (Gillies, 2004; Webb *et al*., 2009b). Meaning is exchanged, not constructed in interaction.

Table 4.4 shows the division of functions of language after recoding all units of meaning, using the four functions of language.

Table 4.4: Percentages of functions of language per dyad per lesson, including the instrumental function

	Biology N=389	Economics N=478	English N=133	History N=207	Sum N=1207
Exploratory	3.0	1.5	0.2	6.0	2.5
Pedagogical	0.5	2.5	–	–	1.0
Instrumental	50.0	58.0	44.8	67.0	54.5
Social	46.5	38.0	55.0	27.0	42.0

As Table 4.5 shows, the instrumental and the social function of language both play an important role in student interaction in seatwork. They are however still rather indistinctive. Further distinctions within these functions might shed a more detailed light on student interaction in seatwork.

Procedural and content-related use

As the transcripts in Section 4.4.3 showed, there were two different ways in which the instrumental function was used. Transcript 4.2 showed the use of the instrumental function as an instrument to answer the questions posed in the task. Students articulated what the Dutch definition of Elephans Maximus was and whether this animal's natural habitat was in the Netherlands. Transcript 4.3, showed the use of the instrumental function as an instrument to establish the proper procedure of answering the task. Through assertions and counter assertions students established what exactly they had to do: A, B and C or question 18.

A distinction in two modes can therefore be made within the instrumental function of language. Language is used as an instrument to complete the task, first regarding the *content* of the task. Students articulate answers and discuss them in assertions and counter-assertions. Second, language is used as an instrument regarding the *procedure* of the task, in formulating what students have to do and how to do this, again by using assertions and counter-assertions. I reanalyzed the instrumental units of meaning with respect to these two modes. Table 4.5 shows the percentages of procedural and content-related instrumental function of language.

Table 4.5: Percentages of procedural and content -related mode of the instrumental function of language per dyad per lesson

	Biology N=389	Economics N=478	English N=133	History N=207	Sum N=1207
Procedural	3	16	13	38	24
Content-related	16	36	29	23	26

4.4.5 The social function of language

In view of its abundant occurrence, the social function of language in interaction too, deserved further study. After rereading and reanalyzing the units of meaning characterized as 'social function of language', two distinct uses emerged. It appeared that the social function of language in interaction was used both off-task and on-task. Off-task, the social function of language constructed a social relationship between students. On task, the social function of language expressed a specific attitude towards the task (Transcript 4.5) or towards the way students worked on the task (Transcript 4.6).

R: Oh god, these are nasty tasks
B: Yes, pretty nasty

Transcript 4.5: Economics – Bert and Rinette

B: Well, we did a good job, didn't we?
R: Yes, we did

Transcript 4.6: Economics – Bert and Rinette

Both transcripts showed the construction of a social relation between the students. In 4.5 Bert and Rinette expressed their mutual feelings of dislike concerning the tasks they had to work on, constructing a shared attitude. In Transcript 4.6 both students articulated their shared success in seatwork, constructing a shared sense concerning their working relation.

In addition, the social function of language concerning the task was observed when students joked about the task or when they associated the task with personal events. The social function of language furthermore occurred when students organized the use of equipment in dealing with the task, such as calculators, pencils and computers.

M: Where is the mouse anyway?
A: Just grab a mouse from another pc
A: You'll have to restart if you do

Transcript 4.7: Biology – Marieke and Angie

Although Transcript 4.7 at first sight seemed to show language being used as an instrument for eventually completing the task, the units of meaning did not concern the task directly. In the context of two students interacting in seatwork, these units of meaning were therefore not categorized as the instrumental function but as the social function of language in interaction. By sharing information about the whereabouts and the use of the mouse, Marieke and Angie constructed a shared sense of the actions both of them needed to undertake in order to start working on the computer, and thus constructed a shared sense of their social relation in this situation.

The social function of language constructs and maintains social relations between people. This means that this function mostly concerns personal topics. However, as Transcript 4.5 to 4.7 show, the social function could also be used in task related matters. These units of meaning were influenced by the task, and in turn may have influenced verbal interaction concerning the task. This will be subject of further study in Chapter 5.

The notion of conversational topics appeared to be a distinctive characteristic. The instrumental function of language could be regarded as language use that concerned the task as conversational topic, while the social function of language could be regarded as language use that could concern both the task and personal matters. When looking at the pedagogical and the exploratory function of language, the notion of conversational topics can also be added as a distinctive characteristic. Both functions of language appeared to be intertwined with the task students were supposed to work on.

4.5 The framework

An analytical framework was constructed for the labeling of all units of meaning of students in seatwork. The four functions of language are represented in Table 4.6, together with their defining characteristics. In addition, for each function, positive and negative examples derived from student interaction in seatwork are presented. In contrast to the first draft of the framework, the characteristic aspects of language use are presented in the sequence in which they are used to analyze a unit of meaning. In the framework, first the characteristic conversational topics of the functions of language are presented, followed by characteristic speech acts, interactional patterns and interpersonal actions.

Figure 4.2 illustrates how the framework was used as an instrument for analysis. Of every unit of meaning, it was first determined whether it could be regarded on-task or off-task. Since off-task interaction was only a characteristic of the social function of language, the unit of meaning would in that case be characterized as social. When the unit of meaning was characterized as on-task, the speech act that was realized in the units of meaning was distinguished and compared to the list of characteristic speech acts of each function of language. In case of an overlapping speech act, the rest of the episode was used to determine the interactional patterns and the interpersonal actions within the episode. Based on this analysis, a dominant function of language was attributed to each unit of meaning.

The use of the framework was tested by a colleague on three transcripts of student interaction in three different lessons. To assess the inter-rater agreement Cohen's kappa (Cohen, 1960) was calculated, resulting in .88, based on 976 coded units of meaning. I therefore concluded that the framework offered a useable way to analyze units of meaning. In the following studies I will use the analytical framework constructed in this chapter to further investigate verbal interaction in seatwork, starting with a study on student interaction in seatwork in Chapter 5.

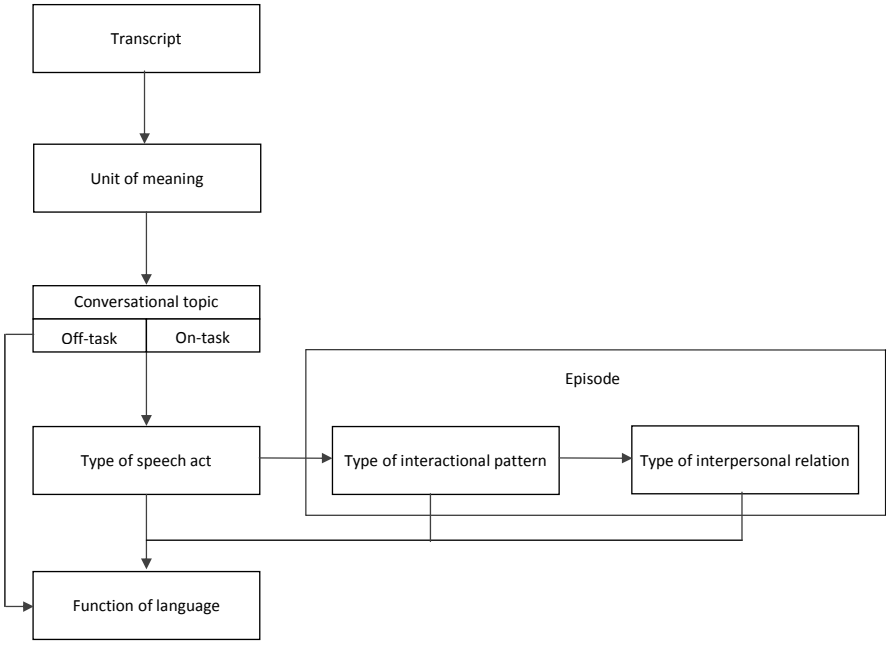

Figure 4.2: Applying the analytical framework step by step

Table 4.6: Analytical framework for the analysis and description of student interaction

	Social function Language used to exchange meaning. Verbally constructing and maintaining social relationship.	**Instrumental function** Language used to exchange meaning as a vehicle for getting somewhere. Verbally pursuing and establishing a goal in reality.	**Pedagogical function** Language used for providing and seeking intellectual guidance.	**Exploratory function** Language used for the verbal construction of knowledge.
On-task Off-task	• On-task • Off-task	• On-task	• On-task	• On-task
Speech acts	• Asking • Answering • Asserting • Counterasserting • Repeating • Confirming • Joking • Making personal associations • Sharing personal opinions	• Asking • Answering • Asserting • Counterasserting • Stating • Counterstating • Repeating • Confirming	• Explaining • Elaborating • Providing arguments • Requesting clarifications • Justifying • Questioning • Counter questioning • Clarifying • Challenging • Counterchallenging • Negotiating	• Explaining • Elaborating • Providing arguments • Requesting clarification • Hypothesizing • Justifying • Clarifying • Challenging • Counterchallenging • Representing • Agreeing • Validating • Reasoning • Articulating propositions • Comparing
Interactional patterns	• Fact sharing • Exchanging meaning • Articulation • Short and longer exchanges	• Exchanging meaning without visible alterations • Articulating • Fact sharing • Choppy interaction	• Gaps in knowledge are recognized • Reasons and evidence are weighed • Subject material is rephrased and clarified • Concepts are reorganized and clarified, misconceptions are recognized • Reasons and evidence for and against positions are provided	• Questions are discussed • Answers are hypothesized • Long turns • Fluid interaction • Uptake • The contributions are in coordination with each other

Interpersonal actions	• Creating a shared sense of relation • Exchanging meaning		• Exchanging meaning • Establishing a goals concerning a task • Pursuing a goal concerning a task • Function may hinder learning, by being constraining or too peaceable		• Hierarchical relation • Mutual sympathy and affection • Cooperative relationship, defined by reciprocity, discussion, mutual respect and by attempts to coordinate one's own views with those of others	• Open attitude • Explorations receive uptake • Participants are equal contributors to the conversation • Language as a joint construction of meaning • Solving of conflicts • Airing of diverse perspectives - a collective resource for the interaction • Conflicting perspectives are clarified in interaction • Conflicting perspectives are considered a valued source for the construction of knowledge, instead of a breach with the knowledge that is considered correct
			Procedural mode Language used to establish the proper procedure	**Content-related mode** Language used to complete the task		
Positive examples	**Off-task social**	**On-task social**	**Procedural-instrumental**	**Content-related instrumental**		
	'Hey, there is Sinterklaas!' 'No, that's Santa'	'I think we are quite far' 'Yes we are'	'Did we have to work on 6 and 7 or on 8?' 'I thought 5'	'Turdus Merula' 'Singing bird'	'What is own capacity?" 'That depends on what you have here, you see?'	'They worshipped one god' 'No the Aztecs had several, if they had a god of rain, there probably would have been more'
Negative examples	(Points at textbook) 'He has long slats' 'Long slats, long arms'	'Do you have French today?' 'Yes, seventh period'	'The answer to 1 is 'many'' 'What?' 'Many'	'It is about when use you what' 'Oh, do they mean it like that'	'They don't mind dying' 'Why not?' 'She asks'	'People who were sacrificed faced a happy existence' 'Where does it say that?'

CHAPTER 5

Verbal student interaction in seatwork

5.1 Introduction

In Chapter 4 an analytical framework for the description and analysis of student interaction in seatwork was constructed. The analytical framework distinguished four main functions of language in interaction: the social, the instrumental, the pedagogical and the exploratory function of language.

Chapter 5 reports on the first study in which the analytical framework was used to describe and analyze how students verbally interacted in seatwork. The concept of 'seatwork' was defined as lessons assigned by the teacher to be done by students at their desks in the classroom (cf. Chapter 1). In the Netherlands, these lessons usually consist of textbook tasks. In the Dutch classroom textbooks are used as a hidden teacher, which stipulates 'default' instruction and learning paths (Bonset & Rijlaarsdam, 2004). Within this textbook-driven context, seatwork is a regular occurrence. In seatwork time in class, students are usually allowed to interact with each other. Although individual products and an individual effort are expected, seatwork is always conducted in a social setting, as Anderson (1984) argued.

The study this chapter reports about is an exploration into the nature of student interaction in seatwork, aimed to discover how students verbally interacted, and whether they constructed knowledge in their interaction. Chapter 5 starts with an overview of the research design of this study in Section 5.2. In Section 5.3 the results of the analysis of both teacher and task instruction are discussed, thus presenting an overview of the context of the students' interaction in seatwork. In Section 5.4 the results of the analysis of the students' interaction are discussed. Section 5.5 finally includes a conclusion and discussion, as well as a presentation of possible implications of the results and an introduction to my further studies.

5.2 Research design

5.2.1 Research questions

This research project aimed to explore the nature of student interaction in seatwork, with a focus on whether and how students verbally construct knowledge in their interaction. In this first study, the following explorative research question was central:

How do students verbally interact with each other in seatwork?

To answer this question, three sub-questions were formulated:

1 Which functions of language can be observed in teacher and task instruction on seatwork?
2 Which functions of language can be observed in student interaction in seatwork?
3 Do students verbally construct knowledge in seatwork?

'Teacher instruction' was defined as the verbal utterances a teacher uttered in order to make clear to his students what was expected from them in the time they were to perform seatwork. 'Task instruction' was defined as the written instruction that embodied a task and informed students of what they were to undertake concerning a certain aspect of a certain school subject. Both types of instruction were described in terms of functions of language, as distinguished in the framework constructed in Chapter 4. The concept 'seatwork' was defined as a certain period of time during class, measured from the moment the teacher started to instruct his students on the tasks they had to work on, to the moment either the teacher centrally decided time was up or the lesson ended. Student interaction was again described in terms of function of language. The notion of 'verbal construction of knowledge' was flagged by the occurrence of the pedagogical function or the exploratory function of language and inferred by the way students use these functions and by the way students deal with conflicting perspectives.

5.2.2 Participants

In order to answer the questions posed in the previous section, I asked two schools for secondary education in the south-west of the Netherlands to participate in a small scale observational study. The two schools offered most educational levels: pre-vocational training, pre-university of applied sciences education and pre-university education. The schools had no particular educational philosophy and the student population was of an average socio-economic background. Seatwork occurred regularly at these schools.

School A was a school without religious denomination. The school consisted of about 1,500 students, mostly originating from the city where the school was located and its surrounding regions. The school profiled itself as a school open for differences

between students, not only in religious denomination, but also in intellectual and physical capacities. The school claimed to pay extra attention to arts and culture. School B was a school with a catholic denomination. Although the school was open to students with other religions, the catholic denomination was distinctly present in the school through religiously themed illustrations and sculptures throughout the building. The school consisted of about 1,300 students, originating from both the city where the school was located, and its surrounding regions. The school claimed to excel in the areas of culture and sports.

Initial contact with each school was made through a teacher. In obtaining entrance to the schools, first the heads of the schools were asked for permission to observe and record students during class. Subsequently, all teachers from the penultimate years of the pre-university of applied sciences level and the pre-university level were asked to participate in a study on seatwork, by way of an internal e-mail. In this e-mail, the nature and the aim of the study were explained in general terms. A number of teachers volunteered to participate. From this group twelve teachers were selected, six from each school. Selection took place based on the school subject the teachers taught to ensure a variety of school subjects throughout the educational spectrum.

The parents of the students involved were notified through a letter containing a reply sheet with which they could give their permission for recordings of their child's interaction. Out of this group of students with parental permission, eight per class were asked to participate in the study just before each lesson started. The students were seated in dyads, and were in all cases allowed to interact in seatwork (cf. Section 1.2.2). The selection of the students was made based on the composition of the dyad. I used a requirement concerning gender to ensure an equal number of boys and girls, and a requirement concerning familiarity between the students to avoid the possibility that the lack of social relationships between the students would form an obstacle in the interaction.

5.2.3 Data collection and selection

During six lessons at each school, each with a duration of 50 minutes, observations were made with a special focus on seatwork periods. In each lesson audio recordings were made of four (and in one case three) student dyads, resulting in 47 audio recordings of student interaction in seatwork. To complement these recordings, additional data was collected. All teachers and, for reasons of time, half of all student dyads were interviewed on their thoughts about school, seatwork, and interaction during class. Both the verbal instruction from the teacher and the written instruction in the textbook were gathered for analysis. The answers that students wrote down were also collected.

I planned to use only a small number of interactions for the in-depth analysis. The relative large number of 47 interactions during twelve lessons was collected to leave margin for eventualities. Indeed, situations occurred that resulted in unusable recordings. In two cases the recording device did not function properly, in another case the students managed to switch the device off and in two cases the dyad did not interact at all. In two observed lessons, the teachers let the students work in groups of

three or four students on tasks the teachers created themselves. These recordings were excluded from my data collection, since they did not represent the regular seatwork situation. All this brought down the number of student interactions suitable for analysis to 32. Since I planned an analytically comprehensive study, I selected twelve student interactions for further analysis. The selection of three out of four recordings was based on convenience, choosing recordings that were the best audible. The twelve student interactions were derived from four different lessons, each containing three recordings of student interactions. My corpus consisted furthermore of the verbal and written instructions, the written answers to the tasks, interviews with eight student dyads and all four teachers.

My selection of the lessons was based on two general requirements. First, to diminish a potential effect of school subject specificity on the results of how students interacted in seatwork, I selected four different lessons, each taught by a different teacher. The school subjects each represented an aspect of the educational spectrum: Economics, Biology, History and English. Second, to be able to compare the observations of different subjects, the objectives of the seatwork task had to be more or less similar in nature. All seatwork tasks originated from textbooks and demanded a simple form of reasoning (Chinn & Malhotra, 2002; Mayer, 1998): calculating, defining concepts or applying rules. All tasks demanded an answer that was either right or wrong (Nystrand & Gamoran, 1997). Table 5.1 provides details on the recorded student interactions.

The time available for seatwork was measured from the moment that the teacher indicated the beginning of the seatwork period after finishing his verbal instruction, to either the moment the teacher indicated that time was up, or to the end of the lesson, whichever came first. As Table 5.1 shows, the duration of the seatwork period differed per lesson, as did the total number of units of meaning per lesson and the average number of units of meaning per minute. The sum of units of meaning per lesson consisted of the sum of the units of meaning of all three dyads in that lesson. The average number of units of meaning consisted of the average number of units of meaning of all three dyads per lesson. Student interaction in Economics and Biology contained more units of meaning than English and History. This was probably due to the difference in time available for seatwork. Students appeared to use more units of meaning when there was more time to interact. However, the number of units of meaning per minute was in every lesson around 36, regardless of school subject and time provided for seatwork.

In Economics, the students worked on only one very large task containing several subtasks. However, they did not need the entire time provided to finish the task. In Biology the students worked on three tasks, containing several subtasks, concerning the same subject: Latin names for species. The students used the Internet to find the answers to part of the task. In all interactions the students needed all time provided to finish the task. In English, the students worked on a small completion exercise, which they all finished before time. In History, the students worked on one task containing a number of subtasks, for which they needed all time provided. The time provided and the scope of the tasks differed per lesson, but since both the teaching method and the

nature of the tasks were comparable, as was the average number of units of meaning per minute, I worked from the assumption that the nature of student interaction in the four lessons was comparable, despite the different school subjects.

Table 5.1: Specifics concerning recorded student interactions

	Economics lesson	Biology lesson	History lesson	English lesson
Seatwork time	28:04	31:37	18:32	14:39
Total number of units of meaning	1,103	1,151	612	556
Average number of units of meaning per minute	39.3	36.7	33.4	38.6
Gender	Female – Female Female – Male Male – Male	Female – Female Female – Female Male – Male	Female – Female Female – Female Male – Male	Female – Female Female – Female Male – Male
Type of task	Calculation task	Defining concepts	Using sources exercise	Applying rules
Description of written task instruction	One large task with subtasks. Students were to make a balance sheet of income and expenditure for the soccer club, using the numbers provided.	Three tasks, with subtasks. Students were to determine the number of families, the Dutch translations and the habitat of a list of Latin names of animal species.	Several smaller tasks. Students were to use sources in answering several questions concerning the Aztec religion, e.g.: 'The Aztecs had a somber view on life. What in source 16 proves this?'	One large task, with subtasks. Student were to fill in the right words in ten sentences and decide why, among which the words 'number' and 'amount'.
Excerpt of verbal task instruction	Work on assignment 38; discover what income and expenditure exactly are, and where to put them down.	Work on assignment 5, a large assignment, work in the usual manner, when finished, continue with Chapter 2.	Work on assignment 8, whisper when speaking, write your answer down, central discussion after ten minutes.	Work on assignment H, choose the correct words, you should be able to do that now.

5.2.4 Analysis

To analyze the recordings of both student interaction and teacher instruction, they were first transcribed as described (cf. Section 3.5). The transcribed teacher and student utterances were divided into units of meaning and episodes. The units of

meaning were subsequently categorized using the analytical framework presented in Table 4.6. The episodes in which the construction of knowledge played a pronounced role were distinguished based on the occurrence of the pedagogical and exploratory function of language and the occurrence of conflicting perspectives. The analytical framework constructed in Chapter 4 was slightly adjusted in the process of using. These adjustments are discussed in Section 5.3.

The first two questions posed in Section 5.2.1 were 'Which functions of language can be observed in teacher and task instruction on seatwork?', and 'Which functions of language can be observed in student interaction during'. To answer these questions a combinatory approach of quantitative and qualitative means was applied, cf. Chapter 3 for a discussion of Mercer's (2004) sociocultural discourse analysis. All functions of language that occurred were counted. Absolute numbers were recalculated to percentages of the total number of units of meaning per teacher to be able to compare the occurrence of the functions of language within the different lessons. Mercer's (2004) qualitative analysis provided an insight into how the different functions of language occurred and provided an insight into how the teacher and the task used language in instructing students on seatwork. In addition, it provided an insight into how students interacted.

Question 3: 'Do students verbally construct knowledge in seatwork?' focused on possible verbal knowledge construction in students' on-task interaction. Episodes in which either the exploratory or the pedagogical function of language occurred, were analyzed. In addition, situations in which conflicting perspectives arose were studied, since these are considered occasions in which the verbal construction of knowledge could occur (Bakhtin, 1981; Nystrand, 1997b).

5.3 Adjustments to the framework

In the process of using the analytical framework constructed in Chapter 4 for describing and analyzing student interaction in seatwork, some adjustments were made to the framework. These adjustments concerned characteristics of the procedural and the content-related instrumental function of language. It appeared that both modes were used to perform a limited number of actions in interaction. These actions were distinguished and collected in the framework as characteristic descriptive elements of both modes in which the instrumental function occurred.

Procedural-instrumental units of meaning could be divided into four actions that students undertook with this language use: 'Initiation', 'Discuss procedure', 'Coordinating action' and 'Refer to text'. 'Initiation' implied the verbal marking of the start of a new element in the students' work, for instance the start of a new task or sub task. 'Discuss procedure' implied the use of speech acts like statements and counter-statements to exchange points of view concerning the procedure of doing seatwork. 'Coordinating action' implied using statements and counterstatements to divide the work students were to do. 'Refer to text' implied all ways to refer to the written text,

i.e. reading out loud, the spelling of words or the articulating of what exactly had to be written down.

Content-related instrumental units of meaning could be divided into three actions that students undertook with this language use: 'Formulate answer', 'Discuss answer' and 'Discuss task content'. 'Formulate answer' implied the articulation of an answer the students deemed proper. 'Discuss answer' implied the use of speech acts like statements and counterstatements to exchange point of view concerning the answer that was formulated. The last action distinguished was 'discuss task content' which implied the use of speech acts like statements and counterstatements to exchange points of view concerning the task content in general. These additions to the framework can be found in the appendix.

5.4 Results – instruction

5.4.1 Teacher instruction

To facilitate the understanding of the interaction of the students, I first discussed both the teacher and the task instruction in the four lessons I studied. This discussion provided an insight in the context in which students interacted and ultimately answered question 1. Table 5.2 provides an overview of the on-task and off-task interaction in teacher instruction. 'N' represents the number of units of meaning in teacher instruction, both per lesson and in sum. As Table 5.2 shows, teacher instruction was solely on-task in all four lessons.

Table 5.2: Percentages of on-task and off-task interaction in teacher instruction on seatwork

	Economics N=11	Biology N=37	History N=21	English N= 7	Sum N=77
Off-task	–	–	–	–	–
On-task	100	100	100	100	100

Table 5.3 shows the functions of language that teachers used when they instructed their students for seatwork. The instructions in English and in Economics were rather short (resp. 7 and 11 units of meaning), the verbal instructions in History and Biology were relatively large (21 and 37 units of meaning). As Table 5.3 shows, the pedagogical function of language did not occur in teacher instruction. The instrumental function of language was most prominent, followed by the social function of language. The exploratory function of language only occurred in the teacher instruction in Economics.

Table 5.3: Percentages of the functions of language in on-task teacher instruction on seatwork

	Economics N=11	Biology N=37	History N=21	English N= 7	Sum N=77
Exploratory function	18	–	–	–	4
Pedagogical function	–	–	–	–	–
Instrumental function	82	71	97	86	84
Social function	–	29	3	14	12

In the Economics instruction, two exploratory units of meaning occurred. The teacher instructed the students to negotiate, and demonstrated how he expected his students to reason, using the exploratory function in the direct mode to illustrate how they should think: 'Now what is income and what is expenditure and where am I going to place them?' The social function of language occurred in three out of four instructions. This function predominantly occurred when teachers motivated their students, both positively and negatively: 'You should be able to do this now' in English, versus 'I know that this task will cause a lot of difficulty to some students' in Biology. In the Biology lesson, the social function was also observed when the teacher provided his personal opinion of the task in his instruction: 'Crappy task'. In History the function occurred when the teacher emphasized the importance of the task 'This task is what's important to me this lesson'.

The function that occurred most often in teacher instruction was the instrumental function of language. Table 5.4 shows the division of the instrumental function of language in both the procedural and the content-related mode. Only in Economics did the teacher use the content-related instrumental mode in interaction. In other instructions, the content of the task was not addressed.

Table 5.4: Percentages of the procedural and content-related instrumental function of language in teacher instruction on seatwork

	Economics N=9	Biology N=36	History N=15	English N=6	INS sum N=66	UM sum N=77
Procedural mode	78	100	100	100	94.5	80
Content-related mode	22	–	–	–	5.5	4

The procedural mode played a pronounced role in teacher instruction. First and foremost, teachers coordinated action. They explicitly stated what the students had to do, for instance: 'Make task 2'. In some cases teachers added what students had to do when finished: 'Start with Chapter 2'. Teachers furthermore laid out what students exactly had to do, they presented the proper procedure for working on the tasks. Teachers used units of meaning like: 'Write down key words'. The teacher furthermore articulated how students were to act when working: 'Whisper when speaking'. In the History instruction the teacher articulated the procedure students should follow in detail, as Transcript 5.1 illustrates.

T: Task 2 reads: "Draw a table in which you state what image is given of the Aztec and Spanish religion". Well, in that task you should say: in source 16 a negative image or a positive image or a somber image is given. Or maybe very positive or something like that. In key words, really simple. Read the text, source 19, 20 and then state what image is given. You don't have to fill out both columns, because it can very well be that in one source only something is said about the Aztecs, and in another only something about the Spanish. So that's task 2.

Transcript 5.1: Presenting procedure in teacher instruction in the History lesson

The History teacher not only articulated which tasks had to be made, but also described what type of answer was expected. He focused on the procedural demands the answer should meet: The answer had to be formulated as key words. He mainly described a procedural aim in using the sources: 'You don't have to fill out both columns'. The teacher's focus in this instruction was strictly on procedural aspects and on the final product, not on the content of the task.

Teachers also read the task or part of it out loud in their instruction. Only the Economics teachers gave additional content clarification to what he read out loud. In both History and Biology a procedural clarification was given. In English the teacher only added a social unit of meaning to encourage students in their work, articulating that the students 'Should be able to do that now'. Transcript 5.2 shows how the teacher in the Biology instruction procedurally clarified part of the task he read out loud:

T: "How do we define the concept of biodiversity?" Yes, well, it is often about the literal answer that you write down, and usually those are very short answers according to this book.

Transcript 5.2: Procedural clarification in teacher instruction in the Biology lesson

In this transcript the teacher defined what the answer should look like to be adequate: literal and short. These requirements were not the requirements the teacher himself claimed to be important, but he referred to the book as a guardian of the procedure. The content of the concept of biodiversity was not addressed. The only content-related instrumental interaction was used in Economics. The teacher did not read the task out loud, but added meaning to the written instruction by clarifying its content: 'It is about an initial balance'.

Teacher instruction in general showed a frequent occurrence of the instrumental function of language, in the procedural mode. The focus of the teacher instruction was not on the nature of the task that students worked on, or on what knowledge they could or had to acquire, but on how students should work and on what the end result should look like.

5.4.2 Written task instruction

In the written task instruction only the instrumental function of language occurred, both in the procedural and the content-related mode. None of the other functions were

used. The absence of both social functions could be explained by the explicit institutional character of a written task instruction. The absence of the pedagogical and exploratory functions of language was perhaps due to the fact that reasoning and guiding students into new knowledge were not necessary to successfully instruct them. All tasks showed the same pattern in functions of language. They usually consisted of the articulation of content-related information on a certain subject, followed by either a content-related question, often containing procedural information on how or where to find the answer, or just a procedural command.

The written tasks in History consisted of a content statement, with the procedural incentive to find proof in the sources: 'The Aztec found that life and death belonged together. What in source 17 proofs this?' or just procedural: 'Make a table and score what image of the Aztecs and Spanish religion is given in source 16 to 20'. The written tasks in Economics contained a content-related discussion of the financial situation of a sports club combined with a procedural command: 'Make a balance sheet of income and expenditure for the soccer club, using the numbers provided'. The written instruction in the English lesson only consisted of a procedural instruction: 'Fill in the right words', after which the words which were to be filled in were provided. The written instruction in Biology consisted of the display of a list of Latin words combined with content-related questions, like 'How many families does the following list of Latin names of species contain?'.

5.4.3 Instructional context

Three out of four written instructions were predominantly procedural, they focused on what the students had to do. The task was represented as an action. The verbal instruction also contained a focus on the procedure, but in contrast to the written instruction, in which the procedural focus lay on what students should do, the verbal instruction in History and Biology also emphasized what the end result, the product, should look like. Although to different degrees, all teachers gave instructions in which the result was given a priority status above aspects that were exploratory or even content-related. In addition, the way teachers discussed the strictly procedural implications of the written task instruction and the way they added predominantly procedural meaning to the written task instructions, attributed a certain status to the task and the textbook. It seemed that teachers perceived the written task instruction as unassailable, as a sacrosanct given. None of the teachers changed something in the written instruction; at most something was added. One teacher even called a task he prescribed 'crappy', yet he continued to explain what answers where expected by the textbook. The written task instruction was treated as if it was a more valid representation of the discourse community the students were to enter, than the teacher himself could ever be.

5.5 Results – student interaction

5.5.1 On-task and off-task interaction

In answering the second question formulated in Section 5.2.1: 'Which functions of language can be observed in student interaction in seatwork?', first the percentages of on-task and off-task interaction were determined. Table 5.5 shows the percentages of on-task and off-task interaction per lesson. The percentages of on-task and off-task interaction were calculated in units of meaning. N represents the number of units of meaning in all student interaction in that lesson.

Table 5.5: Percentages of on-task and off-task student interaction in seatwork

	Economics N=1,103	Biology N=1,151	History N=612	English N=556	Sum N=3,422
Off-task	34	23	17	52	30
On-task	66	77	83	48	70

Table 5.5 shows that on the whole, students used more units of meaning on on-task than on off-task interaction. There were, however, differences between the lessons. In Economics, Biology and History students interacted predominantly on-task. In the English lesson, the division between on-task and off-task interaction was about fifty-fifty. Further study on the situations in which off-task interaction occurred can shed light on why this was the case.

In my data, two situations could be distinguished in which off-task interaction occurred. The first situation was when students encountered difficulties with the task. When students were not able to solve the problems they encountered by themselves, for instance when the aim of the task was unclear or when students did not have sufficient content knowledge to perform the task, they switched to off-task interaction. Transcript 5.3 derived from the Economics lesson illustrates this latter situation.

T: Its probably wrong, otherwise they wouldn't have asked it, but hey…
(1,0)
T: Ah, what the heck

Transcript 5.3: Economics – Tim and Bert

Immediately after these two units of meaning in which Tim indicated that his subject knowledge concerning the task fell short and expressed his demotivation, he and his partner engaged in five subsequent off-task episodes. Many off-task episodes occurred in similar situations, i.e. not as a sign of disinterest, but as a sign of trouble. Only when either the problem was solved by the teacher or by fellow students, or when one of the students explicitly initiated a new task or subtask, did the students continue with on-task interaction.

The second situation in which students tended to use off-task interaction was when they had finished their task, but the time provided for seatwork was not yet finished. Transcript 5.4 illustrates this phenomenon.

K: Not too much
M: Much, much
K: We're finished!
(7,0)
K: I want another one of those
M: Me too! But I don't have enough money

Transcript 5.4: English – Kiki and Martine

The students explicitly declared to be finished with their English task. However, the seatwork period was not yet concluded, since the teacher had not yet called for central discussion, nor was the lesson finished. This resulted in a blank period, a period of time without purpose. The task was finished, but the teacher still granted time to work independently. After 7 seconds of silence, the students initiated off-task interaction, which lasted until the teacher called for central discussion.

In the English lesson this situation of being finished with the task was responsible for two thirds of all off-task interaction, but in the Economics lesson this phenomenon also occurred. Since the difference between the time students were given and the time students needed to complete a task seemed to influence the frequency of on-task and off-task interaction, I calculated the percentages of on-task interaction during only the time students actually needed to work on the task. When the units of meaning after students had declared to be finished with their tasks were excluded from the analyses, the division of off-task and on-task interaction changed as Table 5.6 shows.

Table 5.6: Percentages of on-task and off-task student interaction in time needed for the task in seatwork (in %)

	Economics N=1,103	Biology N=1,150	History N=612	English N=556	Sum N=3,421
Off-task	12	22	16	23	18
On-task	88	78	84	77	82

Both in English and in Economics, rather large differences appeared as compared to the percentages in Table 5.5. The division in on-task and off-task interaction came close to the division within the student interactions in the Biology and History lessons in which the students needed all time provided to complete their tasks. When looking at seatwork within the time students needed, on-task interaction on average took up 82% of the units of meaning students used, ranging from 77% in English to 88% in Economics. Off-task interaction, took up 12% to 23%, with an average of 18%.

Results indicate that student interaction showed more or less the same on-task and off-task division, regardless of school subject and regardless of the extent of the task. The only factor that appeared to have an important influence on the use of off-task interaction was the moment at which students completed the task. When this moment fell within the time provided for seatwork, students turned to off-task interaction. This phenomenon can be explained as follows. Students apparently no longer felt the need to discuss the task when they had finished it, so they switched to other conversational topics than the task. In this dataset, these topics were always social matters and the language used could in all instances be characterized as the social function of language. Since students could not work independently when there was nothing to work on, I excluded the off-task interaction uttered after task completion from my data, resulting in 466 units of meaning fewer in my analyzable data, leaving 2,955 for analysis.

5.5.2 Functions of language in on-task interaction

To further study how often each function of language occurred in on-task student interaction in seatwork, all functions of language were counted and represented as percentages of the total number of units of meaning in each subject, as Table 5.7 shows.

Table 5.7: Percentages of the functions of language in student interaction in seatwork

	Economics N=854	Biology N=1,140	History N=612	English N=361	Sum N=2,955
Exploratory function	2	3	6	0.5	3
Pedagogical function	3	0.5	0	–	1
Instrumental function	77	50	69	68	64
Social function	18	46.5	25	31.5	37

The first that can be observed in Table 5.7 is that the division of the several functions of language showed the same tendencies in all four lessons: Little use of the exploratory and pedagogical function, frequent use of the instrumental function. I had selected a number of different school subjects to prevent my findings concerning the nature of student interaction in seatwork from being influenced by the nature of a school subject. The frequencies of use of the functions of language in seatwork interaction within the four different school subjects, however, indicated that the nature of the different school subjects had no overt influence on the functions of language that occurred.

The second that could be observed from Table 5.7 is that, although general tendencies in frequencies could be observed, the differences in percentages between each language function within the lessons were quite large. In the following sections both the absolute and the relative differences between the lessons and within the lessons will be dealt with in a discussion concerning the four functions of language.

5.5.3 Social function of language

The social function of language occurred quite often in student interaction. In sum 37% of all units of meaning could be characterized as having a predominantly social function. Within these units of meaning, some distinctions could be made concerning the conversational topic. As Table 5.8 shows, in Economics, History and English most social units of meaning concerned off-task interaction.

Table 5.8: Percentages of on-task and off-task social function of language in student interaction in seatwork

	Economics N=127	Biology N=493	History N=138	English N=104	Sum N=862
On-task	28	53	38	27	44
Off-task	72	47	62	73	56

As mentioned in Section 5.5.1, all off-task interaction could be characterized as having a predominantly social character. In theory students could have discussed other school subject related matters and even have constructed knowledge, but this did not occur in my data. The social function of language, however, also occurred concerning the task. Students congratulated themselves on doing a good job or constructed a shared sense of dislike towards the tasks they were working on.

5.5.4 Instrumental function of language

As Table 5.7 showed, in sum 64% of the units of meaning in the time students needed to complete the task could be characterized as having an instrumental function. To explore the nature of the instrumental function of language in seatwork, I first divided the instrumental function into procedural and content-related instrumental interaction, as discussed in Chapter 4. Table 5.9 shows the division of procedural and content-related use within the instrumental function of language, as percentage of all instrumental units of meaning (UM) and as percentage of all units of meaning.

Table 5.9: Percentages of procedural and content-related instrumental function of language in student interaction in seatwork

	Economics N=574	Biology N=533	History N=377	English N=220	INS sum N=1,704	UM sum N=2,955
Procedural	31	65	62	31	48	31
Content-related	69	35	38	69	52	33

The division between content-related and procedural units of meaning in the instrumental function was in sum almost equal. In percentages of all units of meaning in seatwork, a third was used to answer and discuss the task. Another 31%, also almost a third of all units of meaning, was used to talk about procedural aspects: What students

were supposed to do, where they should write their answers down, who should do what part of the task. In short, in 31% of all units of meaning students discussed the proper way to approach the task.

Within the four lessons, however, a rather big difference between procedural and content interaction could be observed. In Biology and History procedural interaction prevailed, while in Economics and English interaction concerning the content was most used, with a ratio of almost 30%-70%. In the following subsections these differences will be discussed.

Procedure

Procedural-instrumental interaction in general is characterized by a focus on what had to be done with regard to the task that both the task instruction and the teacher instruction had laid out. Procedural-instrumental units of meaning were divided into four actions (cf. Section 5.3): 'initiation', 'discuss procedure', 'coordinating action' and 'refer to text'. Table 5.10 shows the division of the four acts within the procedural-instrumental function of language.

Table 5.10: Percentages of procedural actions within the instrumental function of language in student interaction in seatwork

	Economics N=180	Biology N=345	History N=234	English N=69	INS sum N=1,704	UM sum N=2,955
Initiation	4	2	8	7	5	3
Discuss procedure	6	29	25	13	19	12
Coordinating Action	5	11	15	2	9	6
Refer to text	16	22	14	9	17	11
Sum Procedure	31	65	62	31	49	31

'Initiation' occurred little, with an average of 5% of all instrumental units of meaning. Students used initiation to mark the start of a new element in their work, by switching from off-task to on-task interaction, or by declaring that they started on a new sub task. In both History and Biology 'coordinate action' occurred quite a lot. In Biology this could be explained by the situation in which the students worked on their tasks. Students could look up the definitions of the scientific names of certain species on the computer, but since there were not enough functioning computers for all students, the dyads had to share. This resulted in units of meaning like: 'Now press find' and 'Go back to that last window'. In History students coordinated action solely to divide the work, using units of meaning like 'I'll check out source 16 and 17, you can do 18'.

In 'refer to text' things like reading out loud, the spelling of answers and statements about what exactly should be written down, took up 16%. In Biology this was even more with 22%, due to the specific seatwork setting. Since students had to share a computer, this resulted into one student reading the Latin names out loud, so that the other student could search them online.

In Biology and History, the procedure how to carry out the task was relatively often discussed, with a quarter of all procedural remarks. In Economics and English on the other hand, the procedure was discussed much less. The situation in which the procedure was discussed was, however, similar in all lessons. In this corpus of twelve interactions in seatwork, ten started with students discussing the procedure: 'What do we have to do?' The eleventh interaction, in Economics, started with task related social talk on the 'nasty' nature of the task, but was followed by a procedure-discussion episode. The twelfth interaction, in English, started with a content episode in which the students immediately turned to answering the questions. Transcript 5.5 illustrates how the majority of the interactions started:

C: Okay, what do we have to do?
P: I thought we had to do assignment five?
C: Oh yes, we do

Transcript 5.5: Biology – Cindy and Patricia

Only after students had reached agreement on the procedure of the task and what was expected of them, did they start with the content of the task. Usually these procedural episodes were quite short, as in Transcript 5.5. In some cases, however, the discussion between the students was not enough to reach mutual understanding of the procedure. In these cases the procedural discussion episodes were followed by episodes of social talk, until the teacher or peers solved the perceived problem. When the problem was solved another procedural discussion episode often followed, to try again to reach a mutual understanding. Only when this procedural discussion phase was concluded to both the students' satisfaction, did they start working on the content of the task. Students discussed the procedure not only when they started working on a seatwork task: When a new part of the task was started, one that differed procedurally from the first part of the task, student started discussing the procedure all over again.

The procedure was discussed in all student interactions. Its occurrence seemed to have more meaning than simply discussing what to do. In using it, students also created a shared sense of what the task exactly entailed. They ensured themselves that their partner worked with the same mindset, so that the risk of miscommunications about the aim of the task was minimal, and cooperation flowed as smoothly as possible.

In some lessons the procedure was more often discussed than in others. Despite the teacher's additional procedural information in his instruction, both the Biology and History lessons contained tasks in which something was unclear to the students. In both lessons, this obscurity was subject of much discussion. Interestingly, Section 5.4 showed that the verbal instruction in these sections consisted of mainly procedural units of meaning in which it was not only explained in quite some detail what the students had to do, but also what the end result should look like. Despite these seemingly thorough instructions, students apparently still encountered difficulties.

Content

Content-related instrumental units of meaning were generally characterized by relatively short exchanges of instrumental knowledge. It was typical that knowledge remained unchanged during the conversation: Knowledge and information from external sources were treated as a given. No connections were made between concepts, students did not reason or hypothesize. This did not mean, however, that students did not construct knowledge, for they asked questions, answered questions and drew conclusions to some extent. It meant that the creation of knowledge was not dominant in their use of language, but rather that the instrumentality of answering the task was dominant.

Transcript 5.6 illustrates the most common use of content-related instrumental talk in seatwork. Two students compared the Aztec religion with the Spanish religion, using several sources from the 16th century. The two students answered the question and processed new information, but did not explicitly create knowledge in interaction.

M: What do these tell us about life and death of the Aztecs?
M: I'll look at source 17 and 18
J: I know! That they have a good life after death
M: Huh?
J: That they don't mind dying
M: Okay, next
J: (writes down) dy-ing

Transcript 5.6: History – Marije and Janneke

Janneke concluded from the source that the Aztecs had a good life after death, after which Marije asked for a clarification. Janneke rephrased her statement as 'That they don't mind dying'. The use of 'that' at the start of her statement indicates that she meant her unit of meaning as a formulation of an answer to the task. Marije accepted Janneke's unit of meaning, and indicated to move on to the next question. Janneke ended with writing the answer down out loud.

Both students did not discuss the content of the information that passes between them. The answer was formulated, agreed upon and written down, after which both students moved on. Language was used as an instrument to answer the question of the task. Subject knowledge was treated as a static object.

Content-related instrumental talk was divided into three actions (cf. Section 5.3): 'Formulate answer', 'Discuss answer' and 'Discuss task content'. Table 5.11 shows the division of these actions within the instrumental function of language.

Table 5.11: Percentages of content-relation actions within the instrumental function of language in student interaction in seatwork

	Economics N=396	Biology N=187	History N=143	English N=151	INS sum N=1,704	UM sum N=2,955
Formulate answer	31	20	20	31	25	16
Discuss answer	30	11	11	29	19	12
Discuss task content	8	4	7	8	7	4
Content	69	35	38	69	51	33

The first action, 'formulate answer' consisted of utterances in which the answer to the question is formulated, like in Transcript 5.7.

E: "Would you like some more wine? Yes a …"
F: Is plural I think
E: Singular I thought
F: Yes, because… eh
E: I would say 'little'

Transcript 5.7: English – Evita and Floortje

Evita first read out the sentence they had to complete. In the second unit of meaning Floortje defined 'wine' as plural, which Evita contradicted without argumentation: 'singular'. Floortje tried to initiate a form of argumentation, but hesitated. Evita subsequently formulated the answer: 'little'. After the overt formulation of the answer, the students moved on to the next task.

In sum, a quarter of all instrumental units of meaning consisted of units of meaning in which the answer was formulated. Economics and English, in which the content-related instrumental function was used more often than in the other two lessons, contained more units of meaning in which the answer was formulated. In these two lessons, overall more content-related units of meaning were uttered. Students more often formulated an answer and more often discussed these answers than in Biology and History.

In Economics and English, 30% of all instrumental units of meaning were spent on discussions concerning an answer to the task, compared to about 10% in Biology and History. These discussions generally lacked argumentations, but resulted in almost all cases in the formulation of an answer. In the following transcript, the students have to decide when to use the words 'few' and 'little':

M: Few is a little, as in eh there are still eh there is still a little left
K: And much with singular
M: And little is really little, I think
K: And many with plural, many money
M: Oh! (laughs)
K: Many money, few money

M: You don't say it like that, right?
K: No of course not
M: Wait, I'll write it down.
M: 'Little' is few with singular
K: With singular

Transcript 5.8: English, Kiki and Martine

The students both suggested possibilities but hardly responded to each others' units of meaning: each conducted a different conversation. Martine tried to define the meaning of the words, while Kiki decided in which situations the words should be used. Neither student, however, signaled this as problematic: They amicably ended up with an answer: Kiki's answer, which Martine stated to write down: 'Little is few with singular'. This episode can be compared with Mercers' (2008b) cumulative talk, as discussed in Chapter 4. Students did not disagree and did not question each other's contributions: Their contributions cumulated. This cumulating did result in the formulation of an answer to the question, but not an answer that could be considered correct.

The last action students performed when using the content-related instrumental function of language was 'discussing task content'. This action did not occur very often. Students only occasionally shifted focus from answering the task and other practical applicable conversational actions to discussing the school subject content of the task in a more general perspective.

5.5.5 Pedagogical function of language

Both the pedagogical and exploratory function of language occurred very little compared to the social and the instrumental functions of language. The question is why these functions occurred so little, if at all. In this section the use of the pedagogical function of language is discussed.

The pedagogical function of language only occurred once in Biology, and three times in Economics. In Biology the function was used as an easy and quite obviously wrong way to retrieve an answer. Karel asked Titus what the answer was to the question what scientific names were developed by Linaeus. The fact that Titus encouraged Karel to use his imagination in answering the question, indicated that he took his guidance in this transcript not very seriously:

K: Yes, but than what is the answer?
T: Just look here and use your imagination. I see Turdus Merula and Turdus Filomenos. There are two L's in there.
K: Oh, so every word that contains an L?
T: Yes, I've interpreted it like that

Transcript 5.9: Biology – Titus and Karel

In Economics the function occurred more often, but only in the interaction of one of the three student dyads. In this dyad, one of the students seemed to have a better grasp of

the subject than the other. Bert helped Rinette with her understanding of income and expenditure in two pedagogical episodes. Transcript 5.15 is one of these episodes. The numbers between brackets indicate the seconds of silence between the utterances.

B: That one is not so hard, its 20,000
R: And how do we know that, Bert?
B: Yes, well this one is from the first of July, so you add cash and bank
R: Oh, I see
(3,6)
R: Well, that one is easy too then
(3,6)
R: That one is probably 3,200 plus…
B: Yes, plus that 15,000 something

Transcript 5.10: Economics – Bert and Rinette

Rinette expressed her lack of understanding on how Bert arrived at a certain answer, after which Bert explained how he came up with it. His explanation was brief, but lead to understanding with Rinette: 'Oh I see', and her own attempt to apply the new information in the units of meaning that followed.

The use of pedagogical talk is overall quite rare. This might be explained by the nature of the situation. Seatwork is a situation designed for individual work, and the tasks are designed for individual completion, not for cooperation or for peer coaching. For pedagogical talk to occur, there has to be a difference in knowledge or position between students. Even if there was a difference in knowledge and understanding between students, these differences were not called upon, by neither the situation nor the task itself. In addition, the context in which the students operate also did not acknowledge the possibility of students explaining things to each other. None of the instructions, verbal or written, mentioned the possibility of pedagogical interaction among students, nor was the pedagogical function used by the teacher himself in his instruction.

5.5.6 Exploratory function of language

The exploratory function of language occurred not very often in seatwork, but more often than pedagogical talk. A total of 80 exploratory units of meaning were distinguished, most of them in the History and Biology lesson. Considerably fewer exploratory units of meaning were observed in Economics, and only one in English.

It appeared that reasoning and hypothesizing were not often necessary to answer a question. In Economics for instance, in all student interactions the question arose what the concepts 'income' and 'expenditure' actually meant. In the interaction of two dyads the task was completed without defining these concepts. Only one dyad constructed a definition that was explicitly used in reasoning towards an answer (cf. Transcript 5.11). In all other interactions the reasoning that Tim showed in the last line, did not occur.

T: Income and expenditure is this, right?
B: (reads out loud) “2000 entrance and eight euro”
T: Income and expenditure are what you will get, but do not have yet, right?
B: Yes, well, just eh, it is a bit of the regular… eh, let’s see
T: You should put the wages here too
B: A certain amount per period is what this is…
B: I don’t know either
T: Expenditure is something you still have to pay for. This is already paid for, so this doesn’t count.

Transcript 5.11: Economics – Bart and Tim

On the whole, exploratory units of meaning occurred little, and of the 23 episodes in which an exploratory unit of meaning occurred only twelve received uptake. In the other eleven episodes students asked questions like ‘why’ or started a line of reasoning or hypothesizing, without being followed through. These units of meaning were ignored, actively disregarded as not part of the procedure, or they were disregarded as unimportant by their peers. Transcript 5.17 derived from Biology, illustrates the latter:

A: What is question B?
M: Question B: discover after which species the L of Linnaeus is placed. Who belongs to the other species?
A: Probably those names
M: But those aren’t persons right?
A: Yes they are, because here he did -
M: - Oh, nevermind, I get it
A: No, you just want to get it over with

Transcript 5.12: Biology – Marieke and Angie

The focus of the students in their interaction was on the instrumental function of language. This is apparent not only from the large frequency of use of this function, but also from the way students treated exploratory attempts and units of meaning. The focus on finishing the task and following the correct and most effective procedure prevailed over the use of the exploratory function. Students corrected each other and themselves in these exploratory cases, in favor of the instrumental function. In Transcript 5.17 Angie interprets the behavior of Marieke as instrumental-oriented: ‘No you just want to get it over with’. This instrumental focus will be discussed in the following section.

5.6 Conflicting perspectives

The third question read ‘Do students verbally construct knowledge in seatwork?’ As Section 5.5 showed, the instrumental function of language occurred most frequent in student interaction in seatwork. The functions of language associated with the verbal

construction of knowledge, being the pedagogical function and the exploratory function, did occur, although not very often. To further explore the question whether students verbally constructed knowledge in interaction, situations in which conflicting perspectives arose were studied. The way students dealt with these situations seemed especially interesting, since these situations were expected to provide opportunities for exploration. I will discuss three episodes in which a conflict between perspectives arose.

5.6.1 Procedural values

Titus and Karel searched for the Dutch equivalents for Latin names of species on the Internet. Transcript 5.13 shows a conflict between the answer found by Karel on the Internet and the answer provided by the answer booklet.

T: Viola tri-
K: Three colored violet
T: Swamp violet
K: Three colored violet
(1.4)
T: Here it says swamp violet and these are the answers
K: Oh, well then we do three colored violet slash swamp
T: Oh, well then we only hand in my page
K: Okay

Transcript 5.13: Biology – Titus and Karel

In this transcript the answers found on the Internet differed from the answer the answer booklet provided. The discrepancy was made clear in the first four lines, after which Titus declared: 'Here it says swamp violet and these are the answers', with as a hidden argument: 'Therefore this is the correct answer'. Karel did not deny this, but tried to negotiate an official status for the answer that he found by suggesting to write down both answers. Titus seemed to agree at first sight, but on the condition that only his page would be handed in. Karel agreed with this condition.

In Transcript 5.18 a content problem was perceived as a procedural problem, and was solved accordingly. There was a discrepancy between two possible answers, however this did not seem to be the main problem to the students. The problem was whether to write down or not to write down the alternative answer as well. The boundaries of the task, which were not only defined by the instruction, but also by the answers in the answer booklet, determined what was correct. Neither party questioned this, and the fact that Karel agreed that his answer would not be handed in, showed that he too respected the boundaries of the task. He agreed to the fact that his answer would not be seen by the teacher, and would not be discussed in class. The students did not discuss the question why there were two different answers, and who could be right. The booklet of course contained knowledge that was considered to be legitimate. When taking into regard the verbal instruction of the teacher, this assumption by the students

was not very far-fetched. The teacher himself ascribed this status to book and booklet, with his detailed description of what, according to the book, a good answer would look like (cf. Section 5.4). In their interaction, students followed this part of the instruction meticulously.

Working from the assumption that student interaction shows the constructing of systems of knowledge and values of a certain community of discourse, students appeared to construct a value concerning how to work correctly, which implied providing the answer the textbook offered. The value appeared to be a part of the community of discourse the students entered, and both the teacher and the textbook had reflected this value in their instructions.

5.6.2 Gaps in knowledge

The previous transcript indicated that following the correct procedure in the form of finding the prescribed correct answer, was one of the values students shared. In the following transcript students again ascribed great importance to finding the answers to the task. In this episode the focus on these procedural aspects even hindered completing the task.

In Transcript 5.14, students Rinette and Bert discussed a task for Economics. Just before the start of the transcript, they calculated the merits and payments of a sports club, after which they had to make a balance sheet of income and expenditure using the same numbers. The students used the instrumental function of language to come to an answer, and in the process, dealt with classroom knowledge and the question how to use it.

R: Right, make a balance sheet of income and expenditure, using the information given. Uhm, I find that difficult
B: Yes, me too
R: With what… With what do we have to do this?
B: I really don't know. I don't really understand this, Rinette, income and expenditure
R: I thought I got it, but no
(2.6)
R: Uh, do you have to use this again?
B: Yes, probably
R: Well, cash on hand, that's… income?
(2.3)
R: I don't know, I am going to look it up
B: Yes, I am going to do that too
R: I really don't get it
B: Imagine lalalala
(5.3)
B: I think it's income. No, expenditure
(1.3)
B: What is the answer, exactly the same or something?
R: Yes of course. No, isn't it just 300,000?

(2.6)
R: uhhhh
B: 300
(8.6)
R: No, 1,800 I mean
B: You think so?
R: Yes
B: Okay

Transcript 5.14: Economics – Bert and Rinette

In the first lines, the students indicated not to know what income and expenditure are. They lacked content knowledge which prevented them from answering the question. After they concluded that they both did not know what the economic concepts of income and expenditure were, they started to look for a solution to their problem. Rinette suggested a possibility: Did income and expenditure concern the same numbers as the previous questions? That option was accepted by Bert. The knowledge which numbers the questions concerned was however not enough to be able to answer the question. Rinette took charge and classified the first item hesitantly as income.

However, she deduced from the silence that followed that her partner did not agree, so she disqualified her attempt with 'I don't know' and suggested to look in the textbook for an answer. Bert agreed to that. After a reading silence of 5.3 seconds, Bert hesitantly proposed to classify it as expenditure. Despite the silence that followed his hesitation, Bert continued with what he thought should be the answer: The same as the last question. Rinette agreed and articulated the answer in a proposition: 300,000. A miscalculation, it appeared, because Bert thought the answer should be 300. After a silence of 8.3 seconds in which Rinette worked on her calculator, she presented the final answer: 1,800, which was accepted by her partner.

The main problem in Transcript 5.14 was that both students did not know what exactly income and expenditure were. Halfway through the example they started towards a more fundamental solution to the problem, by deciding to check the textbook. However, instead of formulating a definition, the information the students read was directly applied on answering the task: 'I think it's income. No, expenditure', combined with a proposal for the right number. Instead of defining concepts, students calculated numbers.

Despite the lack of a definition, an answer to this question was formulated that satisfied both students. However, when they arrived at the following balance sheet item, the same definition problem arose: What exactly are income and expenditure? The short term solution of the students resulted in the long run in the same problem with every sub-question. The nature of the items contributions, subsidies, interest, and repayment of loans were all points of the same discussion. Although in the long run this verbal behavior was in this respect not very effective, since it resulted in a lot of seek- and guesswork, the students did continue this course of action to mutual satisfaction. They even concluded their seatwork stating: 'There. We did a good job!'.

The efforts of the students in seatwork were focused on the completion of the task, even, as Transcript 5.14 shows, at the cost of understanding. The utterance of Rinette in the fourth line was illustrative for this attitude: 'With what do we have to *do* this?'. The finishing of the task was central, not the construction of new understandings. The verbal construction of knowledge was in all interactions conducted as in this transcript. Knowledge was treated as a means to finish a task, as something that should be applied to a question, not as an aim in itself. This procedural aim prevailed over the construction of classroom knowledge, even in this situation in which the construction of this part of classroom knowledge could have made the completion of the task considerably less complicated.

5.6.3 Dealing with explorations

The function of language which is theoretically most strongly associated with the construction of classroom knowledge is the exploratory function of language. Section 5.5.5 showed that this function of language occurred little in the twelve interactions in seatwork. About half of the exploratory attempts did not receive uptake. The following transcript illustrates how strongly students adopt the values of the community of discourse they enter. Marlou and Nikki had to 'prove' that the religion of the Aztecs was a somber one, by using several sources. Marlou doubted the presupposition (i.e. the religion of the Aztecs being somber) of the task they were working on.

N: That is a negative image, a somber image
M: Yes, it kinda is
M: Because?
N: But you only have to write down keywords, so eh you don't have to give a reason
M: Yes you did, you had to eh… something eh
N: Hahahaha
N: Okay
M: We had to say why it was somber, keywords of it
N: Grrr, that's a shame
[…]
N: allright seventeen
(13,2)
N: That is of co..
M: But I mean, this doesn't have to be somber right? It may be somber to us, but not to them, right?
N: Well, I don't think they have much joy in their lives
M: Maybe they do, maybe they like it when their hearts are ripped out… no just kidding
N: You really think so. Hey, those Mexicans here, those Mexicans, are they also part of the Aztecs?
M: Yes they are
(7,8)
M: I don't think it is that somber really… They think death is the start of a new life
(2,6)

M: That is kinda beautiful, right?
N: (Laughs)
N: Ehm, well, then you put down somber to us, positive to them
M: Yes, actually yes
N: Yes
(29,2)

Transcript 5.15: History – Marlou and Nikki

In Transcript 5.15 Marlou tried to initiate a discussion on the question why the Aztec religion should be somber as the task presupposed. After this attempt failed, she tried twice to convince Nikki of her point of view, i.e. that the view on life of the Aztecs did not necessarily have to be somber. The first time Nikki dismissed Marlou's attempt by pointing out the boundaries of the task, since reasons did not have to be given. This which resulted in an instrumental discussion about the exact procedure of the task. The second time Marlou tried to discuss the somberness of the Aztecs, Nikki disregarded her attempt by challenging her statement rather blunt without argumentation: She did not agree. Perhaps in an attempt to save face, Marlou turned her contribution into a joke, and Nikki initiated a new topic.

After a seven second period of silence Marlou tried for the third time to discuss the Aztec somberness. This still did not lead to a discussion, but it was at last regarded as a contribution. Nikki suggested she should write her opinion down, which Marlou hesitantly accepted.

Transcript 5.15 shows the friction between the procedure and the content objective of the task. The fact that Marlou tried to deviate from the explicit task instruction was not accepted by her partner: her attempts to introduce a more exploratory point of view were disregarded with procedural remarks and blunt denial. Only the last attempt was accepted, not as a valid content contribution, but as a procedural consequence: If she believed that, she should write it down. At first, Nikki treated Marlou's contributions as an attempt to discuss the procedure of the task. After Marlou insisted, Nikki treated her contributions as content-related instrumental utterances, i.e. as answers, as ways to finish the task. She made it clear that she did not agree with Marlou's answer. It was wrong, and in a final attempt to stop Marlou from giving the wrong answer, she suggested that Marlou should write it down. With this last suggestion she put Marlou's exploratory attempts back in the task procedure.

When we take a closer look at the verbal and written instructions, Nikki did have a point in sticking to what had to be done. Marlou's exploratory attempts were indeed not the correct answer, nor were they part of the correct procedure. As discussed in Section 5.4 both the verbal and the written instructions of the History lesson consisted of instrumental functions of language, dominated by procedural demands. The teacher instruction was even quite detailed on what the tasks should produce.

In the written task instruction a content-related statement was made as a premise of which the validity was beyond question: The Aztecs had a somber view on life. Students were instructed to find proof for this statement, not to question it. The task

did therefore not appeal to the students' ability for critical thinking, but to their ability to recognize arguments in a text and to reproduce them. It could be argued that Marlou tried to learn from the task, to even think beyond the task instruction, and that Nikki kept Marlou from exploring the content by sticking to the task procedure. From another perspective however, it was Marlou who did something she should not do, who violated the boundaries of the task. From that perspective, it was Nikki who tried best to do what was asked of her, and it was Marlou who kept Nikki from doing the right thing.

5.7 Conclusions and discussion

5.7.1 Conclusions

In this study, I set out to explore the nature of student interaction in seatwork by answering the question:

How do students verbally interact with each other in seatwork?

To answer this question, a number of sub-questions was formulated:

1 Which functions of language can be observed in teacher and task instruction on seatwork?
2 Which functions of language can be observed in student interaction in seatwork?
3 Do students verbally construct knowledge in seatwork?

Teacher and task instruction

The first question this study set out to answer was 'Which functions of language can be observed in teacher and task instruction on seatwork?'. In both the teacher and task instruction the instrumental function of language prevailed, with a focus on the procedure. Teachers explained in detail both the correct procedure of seatwork concerning the prescribed tasks, and the nature of the product students were to deliver. School subject content and the concept of learning did not play a part in either the teacher instruction or the task instruction. Both teacher and task presented the task as work to be done, not as opportunities for learning. In their instruction, teachers focused on the importance of the textbook, instructing their students to do what the textbook 'wanted to hear'. They attributed a status of importance and dominance to the textbook and appeared to treat the textbook as a valid member of the community of discourse.

Student interaction

To answer the second question: 'Which functions of language can be observed in student interaction in seatwork?', first the on-task and off-task interaction was studied.

The total percentage of off-task interaction was influenced by the fact that at the moment students had finished their task they turned to purely off-task interaction. When this off-task interaction was excluded, analysis showed that student interaction during the task was on-task in 82% of all units of meaning. Off-task interaction mostly occurred as a fallback option. In addition to situations in which a certain personal matter just had to be discussed or when an element from the task was associated with personal matters, students also interacted off-task when they encountered difficulties with the task. Students actively corrected each other when they thought they were off-task for too long. All in all, the students in my corpus were quite conscientious when working independently, and quite prone to do as they were asked.

As the results showed, not all functions of language occurred to the same extent. Both the instrumental and the social function of language occurred most often, with 64% and 32% of all units of meaning, respectively. The exploratory function occurred in only 3% of all units of meaning, and the pedagogical function in only 1%. All in all, the instrumental function was dominant in student interaction in seatwork. To work on the tasks, there was no need to reason or to hypothesize. Students only needed to use language as an instrument to be successful. In most cases the tasks were completed at the end of the seatwork period and students were often pleased with themselves afterwards. They usually patted themselves on the back when finished, stating to each other that they had done a good job.

Students put a lot of emphasis on following the correct procedure. Arguments for this conclusion were both the large number of procedural remarks and the procedural way students handled content-related problems. The latter indicates that to the students, following the correct procedure was just as important for successful seatwork as finding an answer. The explicit use of the procedural-instrumental function deserves further attention and will be discussed below in Section 5.7.2.

Verbal construction of knowledge

The third question this study aimed to answer was: 'Do students verbally construct knowledge in seatwork?'. Both the exploratory and the pedagogical function of language occurred little in student interaction in seatwork. Verbal construction of knowledge therefore occurred only rarely, even in situations in which conflicting perspectives arose. Instances of verbal knowledge construction were treated by the students as inappropriate behavior. Students corrected themselves and each other in situations in which the verbal construction of knowledge could occur, in favor of following the proper procedure. Students in addition ignored or disregarded attempts by peers to verbally construct knowledge.

The relative absence of the pedagogical function could be explained by the nature of the situation. It did not call for, nor was designed for pedagogic interaction. The fact that the exploratory function occurred little, could be explained by the same cause as the absence of the pedagogical function. The task students that worked on did not explicitly ask for reasoning or hypothesizing, and neither did the teacher in his verbal instruction. Students were asked to calculate, to fill out, to find arguments, to find out.

Instructions that in theory needed a form of reasoning to be carried out, were in practice perceived by both students and teachers as instructions just for action, not for the construction of knowledge.

The nature of students' verbal interaction in seatwork

The question central to this study was: 'How do students verbally interact with each other in seatwork?' I worked from the assumption that interaction leads to the construction of knowledge, since all users of interaction enter, construct and maintain certain communities of discourse in their interaction. Students constructed a discourse community in their interaction in seatwork by expressing language functions and by correcting themselves and each other in using language. In this process students constructed values and knowledge appropriate for the community of discourse they were entering.

Students placed a lot of emphasis on following the procedure, i.e. working in the manner the teacher and the textbook prescribed. This value prevailed in situations where a conflict of perspectives arose; for instance, when students encountered knowledge that was in conflict with knowledge the textbook embodied, when students themselves constructed knowledge that was not part of the scope of the task, or when students encountered gaps in their knowledge. Through exhibiting the instrumental function as the proper function when correcting each other, students expressed the proper values and knowledge systems of the discourse community they were entering and constructing.

The exploratory function of language appeared not to be a part of the discourse community the students entered. The exploratory function of language hardly occurred, and in the cases in which this function did occur it was treated by fellow students as inappropriate. This was not debated, but seemed an accepted part of the values and knowledge systems of that discourse community to all students.

When looking at both the teacher and the task instructions, students seemed to do as they were told. Both instructions focused on procedural aspects of working independently: What to do, how to do it, what to write down. In fact, similarities could be observed between the functions of language in the instruction, both written and verbal, and the functions of language in the subsequent student interaction. In the teacher instruction in English, History and Biology, in particular, detailed descriptions were given of procedural elements. The way students should carry out their seatwork was emphasized. Students in these lessons subsequently focused on procedures in their own interaction. They used procedural-instrumental units of meaning and dealt with problems, even content problems, mainly procedurally.

In the teacher instruction in Economics, in addition to the procedural-instrumental function, the content-related instrumental function was also observed. The student interactions in this lesson subsequently also contained more use of the content-related instrumental function of language than in the other two lessons. Students seemed to follow the instruction they were given meticulously, not only with respect to the content of the instruction, as could be seen in the conscientious way the students predominantly discussed the task in seatwork, but also in language functions. Student

interaction predominantly showed the instrumental function of language with a focus on the procedure, just like the teacher and task instruction. Student interaction appeared to mirror the instruction.

From this observation, it appeared that students entered the community of discourse the teacher reflected in his instruction in seatwork. However, this did not appear to be the community of the school subject, since the content of the task was seldom subject of discussion. Rather, it appeared to be the discourse community of the school. The values and knowledge constructed in interaction concerned how to go about in working independently on seatwork tasks, how to interact and how to approach the answering of the tasks. In most cases, the teacher instruction appeared to reflect only the discourse community of the school; the discourse community of the subject hardly played a role.

5.7.2 Discussion

Teacher and task instruction

The question is why both teacher and students reflected the discourse community of the school in their interaction in seatwork. A plausible answer concerning the teacher and the task could be found in the type of interaction that was studied. Of all teacher interactions in the classroom, I only studied the instructions into seatwork. Of all texts in the textbook I only studied the instruction. An instruction is a type of interaction that implies certain use of language, since the aim is telling students what they should do. However, the aim of seatwork in general is not just doing; it is learning by doing (cf. Chapter 2). School subject content is an explicit part of working on seatwork tasks. In textbooks only the 'do' part is usually addressed – school subject content is seldom discussed in written task instructions. But why do teachers address this part of seatwork so little in their instructions?

In Dutch education the textbook determines most of the teaching-learning process (Bonset & Rijlaarsdam, 2004). To a teacher, the textbook seems an important part of the discourse community of being a teacher. Since the textbook plays such an important role in Dutch education, it is quite feasible that teachers perceive the language use of the textbook as a representation of the discourse community that should be adhered to in instructing students into seatwork. The instruction of the Biology teacher supports this hypothesis:

> T: And it starts with a crappy task: "How do we define the concept of biodiversity?" Yes, well, it is often about the literal answer that you write down, and usually those are very short answers according to this book.

Transcript 5.17: Teacher instruction in Biology

The teacher explicitly addressed what the textbook wanted to hear: A literal and short answer. The teacher advocated and explained the expectations of the textbook; he attributed an important status to what the textbook wanted and the exact procedural

nature of what the textbook expected, despite his own characterization of the task as 'crappy'. The teacher appeared to treat the textbook as a valid member of the discourse community in which both the teacher and the students were engaged. Moreover, the textbook was treated as an authority in the discourse community, not even 'hidden' as Bonset and Rijlaarsdam (2004) argued, but as a 'valid teacher', which stipulates 'default' instruction and learning paths.

Conflicting perspectives

In studying possible instances of verbal knowledge construction, I worked from the assumption that situations in which conflicting perspectives arose would be especially suitable. However, as my analysis showed, these situations did not have the expected result. Conflicting perspectives on subject content led to a re-establishment of the proper procedure, instead of to the verbal construction of knowledge.

A possible explanation for this observation could be found in the way students dealt with these conflicts. They appeared to perceive them not as conflicts *within* a community of discourse, but as conflicts *between* communities of discourse, i.e. the community of discourse of the school versus the community of discourse of the school subject. In the discourse community of the school subject, the exploratory function of language could be a valid language function, however in the community of the school it was not. In this community, language as an instrument appeared to be the proper way to use language.

In some cases students did try to enter a different discourse community with the exploratory function of language, but, as discussed in Chapter 2, all discourse communities protect themselves: values and knowledge that go against the values and knowledge systems of the dominant discourse community are actively disregarded. In student interaction in seatwork this appeared to be the case. The discourse community of the school obstructed attempts to enter the discourse community of the school subject.

Further research

There appeared to be a conflict between two discourse communities in student interaction in seatwork. A dominant value of the discourse community of the school, i.e. following the correct procedure, obstructed the verbal construction of knowledge. Student interaction in seatwork mirrored the teacher instruction, showing the same language use in focus and frequency of functions of language. The fact that teachers used language as they did could be a result of the important role the textbook played in the teacher instruction. Teachers referred to the tasks and the textbook as authorities. In addition, the nature of the tasks was rather straightforward, since students needed to find an answer that was either right or wrong. The right answer was preferred, and the definition of 'right' was determined by the textbook or the teacher.

The question is whether a different setting, one in which teacher, textbook and task play a different role and in which students receive more autonomy in working, in short: a situation in which a different community of discourse was constructed, would result in

different student interaction. Perhaps more encompassing tasks could invite students to more exploratory interaction, and perhaps teachers who are less influenced by the authority of the textbook might construct different values concerning working independently. In the following study, I therefore explored student interaction in a different form of working independently from the teacher: in collaborative learning.

CHAPTER 6

Verbal student ineraction in collaborative learning

6.1 Introduction

The previous chapter described which functions of language could be observed in student interaction in seatwork, and focused on the question whether students verbally constructed knowledge in their interaction. It appeared that students focused on procedural aspects of seatwork, rather than on school subject content. Verbal construction of knowledge was in many cases obstructed by the procedures students followed and the procedural values students adhered to. Teacher and task instruction were also characterized as procedurally focused. Student interaction and teacher instruction showed many similarities, both in the frequency of occurrence of the functions of language and in the values teacher and students adhered to in their interaction. The focus of teacher and task on what students should do and how students should work, seemed to influence the predominant procedural-instrumental way students interacted and the way they dealt with instances of verbal construction of knowledge.

Nystrand and Gamoran (1997) proposed a range (cf. Figure 2.1 in 2.3) in the suitability of small group work for the co-construction of knowledge, based on the degree of student autonomy and the complexity of the task. On the very left they placed 'collaborative seatwork' in which students experience little to no autonomy in working and learning and in which the task implies a right or wrong answer. The seatwork situation I studied in the previous chapter could be characterized as this type of small group work. On the very right Nystrand and Gamoran (1997) placed 'autonomous problem solving'. In this form of small group work students receive a large degree of autonomy in working and learning and the task requires a complex product in which the notions right and wrong do not play a pronounced role. 'Autonomous problem solving' is considered ideally suited to facilitate the cognitive and social development of students (Linden, 1999; Nystrand & Gamoran, 1997).

To study whether a teacher and task instruction with more student autonomy would result in different student interaction, I decided to explore student interaction in a situation intended as a form of 'autonomous problem solving', i.e. a collaborative learning situation. I expected student interaction in this approach to contain more exploratory interaction, a greater uptake of exploratory units of meaning and a less procedural treatment of situations in which a conflict of perceptions concerning the

task occurred. I was especially interested in the nature of the teacher and task instruction in relation to the nature of student interaction during this form of small group work as compared to seatwork.

This chapter presents the results of this study. For the analysis of the interaction I again applied the analytical framework constructed in Chapter 4. Since this framework was constructed based on data derived from interaction in seatwork, some adjustments were made to describe the specifics of student interaction in collaborative learning. Section 6.2 provides an overview of the research situation and of the research design of this study. In Section 6.3 the adjustments made to the analytical framework are discussed, and in Section 6.4 the results of analysis of the instructional context is presented. In Section 6.5 the results of the analysis of the students' interaction are discussed. In Section 6.6, I answer the questions posed in this study and make suggestions for further study.

6.2 Research design

6.2.1 Research questions

I was interested in how the instructional context, i.e. the instruction of the teacher and the nature of the task, would relate to the interaction of the students and to the occurrence of the verbal construction of knowledge, in a situation designed to facilitate this verbal construction of knowledge. My central question was:

> What aspects of teacher and task instruction influence students' language use in collaborative learning as compared to seatwork?

To answer the central question, three questions were formulated, similar to the ones that guided the previous study (reported on in Chapter 5):

1 Which functions of language can be observed in teacher and task instruction on collaborative learning?
2 Which functions of language can be observed in student interaction in collaborative learning and can this be related to the instruction students received?
3 Do students verbally construct knowledge in collaborative learning and can this be related to the instruction they received?

The concept 'collaborative learning' was defined as a form of small group work similar to Nystrand and Gamoran's (1997) 'autonomous problem solving'. The collaborative learning situation aimed at providing students with a large degree of autonomy in working and learning, and at providing students with task which require a complex product in which the notions right and wrong do not play a pronounced role.

In the collaborative learning situation I studied, teacher instruction took place in individual interactions with student groups. Studying the nature of the teacher instruction therefore implied the analysis of such sessions. Textbooks and written tasks played a marginal role in this collaborative learning situation. Since students created a large part of the task themselves, the concept 'task' differed a great deal from the task in seatwork. Within the setting of collaborative learning, the concept 'task' could be defined as the activities of the students in collaborative learning as constructed by both the written task, the form of small group work, the teacher and the students in their interaction.

Furthermore, the concept 'interact' was defined as all verbal units of meaning students utter to each other during the collaborative learning period. I defined the notion of 'verbal construction of knowledge' as both the pedagogical and the exploratory function of language in student interaction. In studying the verbal construction of knowledge, I did not only study units of meaning in which these functions were dominant, but also situations that were considered potentially beneficial to the verbal construction of knowledge: situations in which a conflict of perspectives arose between students.

6.2.2 Participants

In the south of the Netherlands I found a school that was conducting a project with a design that met all characteristics of the approach described as 'autonomous problem solving'. The work-setting was designed to provide students with a large degree of autonomy in how to approach the task. The teacher's role was intended to be a coaching one. He was only to set the parameters for the group work, while students themselves were to work out ways to address issues and answer questions, thus promoting a sense of autonomy and ownership. The task was designed to contain open-ended questions to which multiple answers could be given, and was aimed at student collaboration. The groups that students worked in were composed by the teacher, aimed at having good, average and weak students working together.

The school on which this project took place offered all educational levels, from preparatory vocational to pre-university education. The school did not adhere to a particular educational philosophy. The student population consisted predominantly of youth from the city where the school was located and was of an average social-economic background. The students I studied were 16 to 17 years of age, and were in the penultimate year of pre-university education. Initial contact with this school was made through a former teacher of the school. The head of the school was subsequently asked for permission to observe and record students during the collaborative learning hours. After initial permission was granted, all teachers that guided the students during these hours were asked for permission to observe and record them. Selected students were individually asked to participate in the project and for their permission to record their interactions.

6.2.3 Background of the collaborative learning project

The school at which I conducted this study had introduced collaborative learning as a way to implement and shape a form of education in which school subjects were taught in an integrated manner. The project aimed at making students' learning aims central in education. The project as a whole did not replace traditional education, but was conducted alongside regular lessons and took up about a third of all education time of the year-groups that participated. See Bordier, Van Hoek, Hoogland and Van Huijkelom (2005) for a discussion of the project.

The project was conducted during nine school hours a week, divided over four days in two or three subsequent school hours. The collaborative learning hours consisted of five-week periods in which every individual student completed two research projects in two different student groups. The entire year-group of about fifty students was present during these hours. One double classroom, featuring tables and chairs in groups of four and computers to the back wall, was the central room in which every collaborative learning lesson started and in which central meetings were held. Every collaborative learning lesson was started by one of the teachers. After the plenary opening, students were free to choose their work spot of the day: the central room, the library, the computer room or two regular classrooms available to this project. Students walked around freely between these locations.

Students mostly worked on research projects they constructed with their groups, based on their interests. Occasionally they worked on research projects pre-constructed by a teacher. The project did not prescribe what the final product should be, however, in practice students mostly worked on papers. Students worked occasionally individually, but most often in small groups that consisted of two to four students; groups of three students occurred most frequently. Student groups were composed by the teachers, in negotiation with the students. Teachers aimed at composing mixed groups regarding gender, peer group and cognitive ability, because they believed that students needed to be able to work with anyone.

An important aspect of the project was the notion of acquiring competences. In contrast with more traditional education, students were not only evaluated on the product they delivered, but also on the way they worked, and on more general aspects, which concerned students' personal attitudes and general learning skills. All these so called 'competences' were available in writing to both teachers and students. The competences list included sixteen competences and an inventory of defining behavioral characteristics for each competence, both positive and negative. Both teachers and students possessed copies of this list. Prior to every research project, students defined what competences they would be working on during that project in negotiation with their teachers. The progress of acquiring these competences was measured using a portfolio in an online tool. In this tool, students placed documents that proved their progress.

The guidance students received was divided into different roles, in practice embodied by two different teachers in the role of 'workmaster' and 'teachmaster'. The role of the workmaster was to guide students in their learning process concerning the

subject content, by connecting new knowledge to prior existing knowledge. In addition, the workmaster played an important role in the everyday practice of the collaborative learning project, for instance in organizing events. The role of the teachmaster was to guide students in their learning process concerning the competences. He had to be an expert in the areas of didactics, pedagogies and psychology of learning, and his main task was to bring students' thinking to a higher level. Both these masters were responsible for the guidance of the students and evaluated the students in their own role. The workmaster evaluated the final product and the teachmaster evaluated the students' progress concerning their chosen competences.

Despite the fact that the project was ongoing for the past five years, teachers and students struggled with the precise aims of the project and the role both teacher and student had to fulfill. Students for instance complained about the organizational complexity of the project. All students worked on two projects at the same time, and so did all of their group mates, but in different group compositions. Finding moments to negotiate with a complete small group was therefore sometimes difficult, as was planning the work for the entire period.

The concepts of workmaster and teachmaster did not function to the satisfaction of some of the teachers. The division between these forms of guidance resulted in teachers having only limited insight in the entire work process of the students, which they felt hindered them in evaluating student progress. The teachmaster only had to monitor student progress concerning the competences. He did not guide the work process, since this was the workmaster's job and therefore had little input to base his evaluations on. The workmaster-teachmaster problem was often discussed in the two-weekly teacher meetings, however without any result. In the interviews I had with the teachers, they mentioned their frustration, but also showed acceptance of the situation: "We discuss this every meeting, but some say it just needs to be this way" (Interview Miss Brown, 11-27-2007). Despite the fact that no official changes were made, some teachers had unofficially decided to be both workmaster and teachmaster at the same time in guiding the students, to solve their problem with the evaluations.

Interaction between workmasters and teachmasters and their student groups was mandatory. At least two meetings per project needed to be initiated by the student groups with both teachmaster and workmaster individually, otherwise the teachers lowered the final grade the students would receive for their work. Students initiated these meetings rather informally. They usually asked their workmasters and teachmasters if they had time to discuss their project in that lesson and then scheduled a meeting for later in that lesson. The interaction between students was just as informal. Students usually planned at the start of the lesson on what project they would work that day.

6.2.4 Data collection

I observed teachers and students for the duration of eight weeks during most of their collaborative learning lessons. The first three weeks I used to understand the specifics of the situation. I talked with teachers and students about what they were doing, familiarizing both myself with the situation, and the students and teachers with my

presence. Since the atmosphere during project hours was rather informal with teachers and students walking in and out, addressing each other when they felt like it, my presence was not seen as out of the ordinary.

After the first three weeks, I started recording one complete collaborative learning period of five weeks. The period itself consisted of seven weeks, but contained a week off and a test week, which were both not counted as part of the period. In these five weeks, I followed three student groups and their research projects, recording all student interactions during the collaborative learning lessons. Students generally moved from one location to another during the collaborative learning lesson, depending on the activities they carried out. To record the interactions of the student groups, I asked one of the group members to take responsibility for the recording device and to take it wherever he or she went during the five weeks of observation. All three students I asked to participate did this meticulously. As a result, recordings show a focus on the interactions this particular student was engaged in.

I not only recorded the student interactions concerning the research projects, but also the interactions that students had with the teachers who guided them. In addition I interviewed all students and teachers on their opinions on the project in general and on the research projects they worked on in particular. I conducted these interviews rather informally: When students were experiencing a moment without work, I used the opportunity to ask them some questions. I used the same approach with the teachers. Students did most of their work on computers. After every collaborative learning lesson I asked the students to email their written work to me, to be used as complementary data. In addition I collected all written materials students worked with, such as the competences list.

6.2.5 Data selection

Since I planned an in-depth qualitative analysis of the recordings, for reasons of available time and means, I selected the interactions of one student group for my analysis. My selection of the student group was based on several requirements. First and foremost, this student group worked on a research project in which the students chose their own topic and formulated their own research questions and methodology, instead of engaging in a pre-constructed project. This type of research project met the characteristics of ‘autonomous problem solving’ concerning the nature of the task and the degree of student autonomy, which would enlarge the chance to find instances of the verbal construction of knowledge.

The student group I selected consisted of three students, two girls and one boy, who will be called Anna, Nina and Morat. Anna was responsible for the recorder. The students differed in cognitive abilities. Nina was considered to be a high achieving student, Morat was considered to be a lower achieving student and Anna could be considered to be an average achieving student. The students knew and liked each other, so unfamiliarity between them would not hinder the student interaction. On a more practical note, the research project these students worked on did not necessitate them to leave school, which meant that all interaction during the collaborative learning

period could be recorded. In addition, the group member I focused my recordings on was present during the entire time the student group worked on their project.

6.2.6 Data description

At the start of the five week period, Anna, Nina and Morat had decided to study the feasibility of the selection criteria of universities for new students and they had chosen a workmaster and teachmaster to guide them. Then they started to encounter difficulties. Their teachmaster, Mr. Smith, went to London for two weeks, and communication was conducted through another teachmaster. As Anna indicated: "Apparently our teachmaster had said to this other teachmaster behind our backs that he didn't approve of our project, but he himself was in London at the time, for two weeks." (Interview Anna, 27-11-2007). When Mr. Smith returned, two weeks into the collaborative learning period, the student group again started to discuss what topic to choose. This time Anna proposed to study the role of Polish immigrants in the Netherlands, which the other students agreed upon quite quickly. The students discussed their plans with Mr. Smith, who this time approved of their research topic. He subsequently offered to fulfill both the role of teachmaster and workmaster. Anna however declined his offer in view of his prior two week absence and the miscommunication that followed. Since their research topic had changed, the students needed a new workmaster. Mr. Smith recommended Mr. Prince, whose expertise lay with social studies and geography. Mr. Prince agreed to be their workmaster, and he, too, offered to take on the role of both workmaster and teachmaster during their project. This time the students accepted.

When the student group had both a topic and a work- and teachmaster, they started working on their project, by brainstorming, planning and coordinating action. Students had decided to present their research project as a written paper, so they formulated a research question and divided the question into several sub-questions. Each student chose his own sub-question to study and wrote an individual section about it, which at the end was merged with the other sections to arrive at a complete paper. In the three weeks that were left of the period, Anna, Nina and Morat worked on the Poles project in eight lessons. Sometimes they worked as a group, sometimes they worked individually and on other occasions they worked in pairs. Anna could be considered the leader of the group. Not only did the recordings focus on her, she also played the unofficial role of group president, by bringing focus, coordinating interactions and planning the work.

The students worked on their project in eight lessons of two to three hours, for a total of twenty hours. Students sought guidance from a teacher on six occasions in three lessons – one with their initial teachmaster Mr. Smith, the other five with Mr. Prince. The number of units of meaning the students uttered differed per lesson, and became less at the end of the project. Students mostly interacted in the starting phase of the project when setting up the study, and interacted less when actually conducting the study, since this mostly took place in the form of writing on the computer. Anna and Nina were always present during the lessons. Morat was absent during three of them.

When the students finished the project, their work was evaluated by Mr. Prince in a final meeting. Their paper was graded with 8 out of 10.

Table 6.1 provides an overview of the recorded data and contains the number of lessons, the duration, the group members present during the lesson, the topics the students discussed, the number of guidance interactions they had and the total sum of units of meaning in that specific lesson.

Table 6.1: Overview of the recorded interaction

	Duration	Present	Aim of the interaction	Teacher interactions	Number of units of meaning
Lesson 1	3 hrs	Anna Nina Morat	Establishing topic and main research question	3	1,572
Lesson 2	2 hrs	Anna Nina Morat	Establishing sub-questions, dividing tasks	–	1,252
Lesson 3	3 hrs	Anna Nina	Discussing content	–	1,401
Lesson 4	3 hrs	Anna Nina Morat	Discussing composition text	2	1,251
Lesson 5	2 hrs	Anna Nina Morat	Discussing content text	–	894
Lesson 6	3 hrs	Anna Nina Morat	Little interaction, working on computers	1	426
Lesson 7	2 hrs	Anna Nina	Discussing written texts	–	658
Lesson 8	2 hrs	Anna Nina	Little interaction, working on computers	–	411

6.2.7 Analysis

The analysis of the recorded interaction took place in a way similar to the analysis of student interactions in seatwork. First, all interactions were transcribed as described in Section 3.5. The transcriptions were subsequently divided into units of meaning and episodes. The units of meaning were categorized as language functions using the analytical framework constructed in Chapter 4. The framework was adjusted before analysis to fit the situation. The adjustments that were made are discussed in Section 6.3.

To answer the research questions concerning the nature of teacher instruction and student interaction in collaborative learning, they were analyzed using Mercer's (2004) socio-cultural discourse analysis. The categorized units of meaning were counted and recalculated in percentages of the sum of units of meaning, both per lesson and overall.

To analyze how students verbally constructed knowledge in interaction with each other and in interaction with the teacher, episodes were distinguished in which the verbal construction of knowledge played a pronounced role. The notion 'verbal construction of knowledge' was defined as the occurrence of the exploratory or the pedagogical function of language. In addition, episodes in which a conflict of perceptions concerning the students research project occurred were distinguished as situations in which knowledge could potentially be constructed. These episodes were analysed with Mercer's (2004) qualitative approach. The meaning students made, was reconstructed by interpreting and re-interpreting units of meaning, using additional data consisting of interviews, observational notes and collected texts as guiding tools in the interpretation process. I furthermore used the concepts derived from the analytical framework as tools in describing how students used language in their interaction in episodes in which the verbal construction of knowledge played a pronounced part.

6.3 Adjustments to the analytical framework

In my analytical framework for the analysis of student interaction in seatwork, I distinguished four functions of language: the social, the instrumental, the pedagogical and the exploratory function of language. In addition, I distinguished two modes in which the instrumental function of language could be used: a procedural mode, focusing on procedural aspects of the task, and a content-related mode, focusing on content-related aspects of the task. Since the nature of the task in seatwork was rather straightforward, involving a question with an answer that was either right or wrong, the topics students discussed could be divided into two main categories: on-task and off-task.

The educational situation of collaborative learning differed in some respects from the seatwork situation. The task was of a more complex nature, demanding not a right-wrong answer, but a written report in which a number of sub topics needed to be discussed to fulfill the task as a whole. Students had to construct a research design, they had to explore their research subject and they had to compose a research report. The complexity of the task resulted in student interaction in which a number of conversational topics were discussed that could all be considered on-task interaction. I adjusted the analytical framework to be able to describe these distinctive characteristics of student interaction in collaborative learning. In a process of going back and forth between the data and the analytical framework, I further specified on-task interaction with four conversational topics. These topics were:

1 The collaborative learning setting. This topic involved interaction concerning the rules, the everyday organization and the aims of the project.

2 Methodology. Students discussed this topic when establishing their research design and research questions.
3 The research subject, being Polish immigrants. Interaction about this topic involved a number of traditional school subjects like economics, political affairs and sociology.
4 Writing. Students discussed this topic when establishing what to write down, how to write it down and where to write it down.

These four topics were added to the analytical framework as descriptive elements of student interaction in collaborative learning. Since the nature of off-task interaction was not a focus of my study, this category was not further specified with conversational topics. The units of meaning in student interaction in collaborative learning were analyzed with this adapted analytical framework, which is presented in the appendix.

6.4 The instruction

6.4.1 The task instruction

The task in the collaborative learning project was only written down to a limited extent. The written task instruction laid out the small group work in general, in procedural-instrumental units of meaning. The task instruction articulated the fact that students were free in their choice of research topic, design and the way they reported about their findings, be it in negotiation with teachmasters and workmasters. The task provided students with freedom and autonomy in what to work on, and how. The task did not contain a right-wrong question, but needed a complex product to be fulfilled.

The written instruction only provided a general outline of what students were to do. The details of the task were constructed by the students in their interactions. Students collaboratively decided what their research subject was and discussed how they would approach their research. The students in addition decided that their final product would be a research paper. Details of the task were also of a large part constructed by the teacher. In the interactions he had with his students, the teacher actively contributed to what research projects the students worked on and how. The task instruction could therefore be regarded as a construct of three parties, being the general written instruction, the students in their interaction and the teacher in the teacher-student interactions.

6.4.2 Teacher-student interaction

Anna, Nina and Morat had six coaching interactions with their workmaster and teachmaster in three lessons. Their first interaction concerning their research project was with Mr. Smith, the rest they conducted with Mr. Prince. Table 6.2 shows both the number of teacher-student interactions per lesson and the total sum of units of

meaning in these interactions. In the lessons not mentioned, no teacher-student interaction took place.

Table 6.2: Number of teacher-student interactions and sum of units of meaning in all teacher-student interactions per lesson

	Mr. Smith Lesson 1	Mr. Prince Lesson 1	Mr. Prince Lesson 4	Mr. Prince Lesson 6	Sum
Teacher-student interactions	1	2	2	1	6
Units of meaning	377	552	506	21	1,456

The interaction between teacher and students was in all cases initiated by the students. The first interaction the students initiated with a teacher was with their initial teachmaster Mr. Smith; he recommended a second teacher, Mr. Prince, who eventually became their work- and teachmaster during the research project and with whom they conducted the five other interactions (6.2.6). Table 6.3 shows what they talked about, in percentages of units of meaning, regarding the four distinguished on-task conversational topics discussed in the teacher-student interaction per lesson.

Table 6.3: Percentages of units of meaning regarding conversational topics in teacher-student interaction

	Mr. Smith Lesson 1 UM=377	Mr. Prince Lesson 1 UM=552	Mr. Prince Lesson 4 UM=506	Mr. Prince Lesson 6 UM=21	Sum UM=1,456
Setting	62	25	22	5	33
Methodology	16	30	19	62	23
Subject	20	38	30	–	30
Writing	–	7	29	33	13
On-task	98	100	100	100	99
Off-task	2	–	–	–	1

As Table 6.3 shows, the setting was discussed quite frequently, with 33% of all units of meaning. The students and the teacher discussed the rules and regulations concerning the project they were in. Especially in the interaction that students had with Mr. Smith, the specifics of the setting were frequently discussed. Although the project was not new to the participants, its everyday organization was often the subject of discussion. The research subject was discussed to the same extent as the setting, i.e. in 30% of all units of meaning. Methodology and writing were discussed less often with 23% and 13%, respectively. Off-task interaction hardly occurred at all. Only in interaction with Mr. Smith did some off-task interaction take place.

Table 6.4 shows the functions of language that occurred in the on-task teacher-student interaction. The summary statistics show no large differences between the frequency of

occurrence of the function of language in interactions with Mr. Smith and interactions with Mr. Prince. The general occurrence of the four functions is comparable between the two teachers.

Table 6.4: Percentages of functions of language in on-task interaction in teacher-student interactions

	Mr. Smith Lesson 1 UM=371	Mr. Prince Lesson 1 UM=552	Mr. Prince Lesson 4 UM=506	Mr. Prince Lesson 6 UM=21	Sum UM=1,450
Exploratory function	11	29	8	–	17
Pedagogical function	4	1	7	–	3
Instrumental function	82	66	72	95	73
Social function	4	4	13	5	7

As Table 6.4 shows, the division of the functions of language in teacher-student interaction was quite similar in lessons one and four. The very short teacher-student interaction in lesson six stood out, which will be discussed in Section 6.4.2. In general, the instrumental function occurred most often in all lessons, with an average of 73%. Despite the more content-oriented learning environment, teacher-student interaction was still predominantly instrumental in nature.

An average of 17% of the units of meaning in teacher-student interaction could be characterized as exploratory, but this percentage varied widely per lesson with 0% in the interaction in lesson six and 29% in the interactions with Mr. Prince in lesson one. The pedagogical function occurred little with an average of 3%. The social function of language also did not occur very often, with an average of 7%. This function of language occurred for instance when students joked with their teacher about his ability to coach a research project on current affairs, in units of meaning like 'You are very current, sir'. In the following sections, I will discuss the occurrence of these functions in on-task interaction in more detail, starting with the social function of language.

The social function of language

The social function of language occurred not very often in teacher-student interaction, with an average of 7% of all units of meaning. The social function of language in general is the function used to construe a social relationship between the participants. Social units of meaning in on-task teacher-student interaction primarily occurred when the teacher told stories about his own experiences with Poles, as Transcript 6.1 illustrates.

T: My brothers, my brothers have the same prejudices about Polish people. They have broken in at their farm five times now, and four times they took bikes and computers. And now they know for sure it were Poles, because they recorded it on camera

N: Hahahaha

T: Four times they just suspected Polish people, but when they said that out loud, they were told off
N: They already said it were Poles?
T: They did not think it was a prejudice. And then they decided to hook up a camera system as security measure
N: Pfff
T: And then one day a Poles Mercedes, a white Mercedes
N: How can you tell its Poles?
T: It had a Poles license plate, and it just drove into the farmyard
N: Oh!

Transcript 6.1: Occurrence of the social function of language in teacher-student interaction, lesson 4, Mr. Prince

The teacher shared an anecdote concerning his relatives and the Poles. The episode had no relation with the research project students were working on, other than the fact that the topic also concerned Poles. The fact that the teacher told something about his personal life, made the teacher-student relationship less formal. Students and teacher constructed a social relationship in the interactions they had.

The instrumental function of language

The instrumental function of language occurred most often in teacher-student interaction with an average of 73%. Table 6.5 shows how frequent the two modes of the instrumental function of language occurred.

6.5: Percentages of occurrence of the modes of the instrumental function of language in teacher-student interaction

Instrumental function	Mr. Smith Lesson 1 UM=314	Mr. Prince Lesson 1 UM=358	Mr. Prince Lesson 4 UM=361	Mr. Prince Lesson 6 UM=20	Sum UM = 1,053
Content-related	37	39	39	–	38
Procedural	63	61	61	100	62

The division between the occurrence of the two modes was in sum around 40-60, except for a very short interaction in lesson six (20 UM). In this interaction Anna checked with the teacher whether she had to put a certain piece of information in her own words or whether she was allowed to quote. This procedural question resulted in a procedural answer. Although the interactions between teacher and students were aimed at guiding students in their project, in more than half of the instrumental units of meaning, the procedure was the focus of the interaction. The teacher-student interactions showed a tendency towards explicit teacher instruction. Transcript 6.2 shows how the instrumental function in the procedural mode occurred in teacher-student interaction.

T: You have to collect information. You have to read information and know what you talk about. Don't tell falsehoods. It has to be correct what you write down.
A: Yes but that is why I don't want the project to get too big. I want to get started.
T: Hmm, but you have to finish collecting first, otherwise you'll get a mixture of causes, consequences and problems
A: Yes
T: And we don't want that kind of report, without head or tail. That's too broad, not delimited

Transcript 6.2: Occurrence of the procedural-instrumental function of language in teacher-student interaction, lesson 1, Mr. Prince

In the first units of meaning of Transcript 6.2, the teacher formulated his instructions concerning the procedure he believed the students should follow quite strongly, using the phrase 'You have to'. The teacher validated his explanation of the procedure with a reference to the inevitable negative effects to the product: Without following the procedure the teacher had just laid out, the product would turn out incoherent. In Transcript 6.3 the teacher followed the same script, instructing the students on the proper procedure and validating the procedure with probable consequences for the product. In this case however, the teacher added possible negative consequences concerning his evaluation of the product.

T: I think you should collaborate more, because now you have to unravel the problem and that takes the three of you.
N: Yes
T: You just can't say 'you do this, you do that' and divide the work
N: But you have to have information first, right?
T: Cause then you'll get a research report that doesn't flow, that doesn't read, and then you'll know what my criticism will be in the evaluation. You can anticipate on that already.

Transcript 6.3: Occurrence of the procedural-instrumental function of language in teacher-student interaction, lesson 4, Mr. Prince

In Transcript 6.3 the teacher articulated what kind of working procedure he expected from his students: collaboration. He emphasized the fact that all three students together should work on the problem. First he formulated his message as his opinion 'I think', but in his second contribution, he shifted to merely articulating the procedure: 'You just can't'. The argument he provided for his statement was of a circular nature: Students had to work together, because the unraveling would take all three students. The negative consequences the teacher described were twofold: Not only would their product be of inferior quality, he also laid out the possibility of a negative evaluation 'and then you'll know what my criticism will be in the evaluation'. The teacher not only laid out the proper procedure, but also provided procedural consequences when the students would fail to meet his procedural demands, being a bad paper and his criticism.

'Instruction', as a style of interacting, formed a large part of the teacher-student interaction. The teacher told students what they should do, how they should do it, and what their final product should look like. The teacher indicated that the product would be correct if the students followed his instructions. The product would be flawed if the students were to follow a different procedure.

The content-related mode of the instrumental function of language in the teacher-student interaction showed two general tendencies. First, the teacher discussed the case of Polish immigrants in the Netherlands in monologic episodes, comparable to whole class teaching. Students did react to the teacher's contributions, but these contributions often had the character of encouraging noises. Secondly, the content-related mode occurred in recitative sequences, as Transcript 6.4 illustrates.

A: I see many Poles move this way
T: Yes, why?
A: Poles
T: What kind of occupation do they have?
A: Ehm… construction worker?
T: Yes, mainly construction worker

Transcript 6.4: Occurrence of the content-related instrumental teacher-student interaction, lesson 1, Mr. Prince

Transcript 6.4 starts with an observation of Anna concerning Poles. The teacher responded with a question which at first sight seemed rather open, but considering the context of the conversation – the fact that Poles migrate to the Netherlands to do construction work, can be considered common knowledge – this question could only be meant recitative. Anna however misinterpreted the question, after which the teacher specified his question with a clear recitative question 'What occupation do they have?'. Anna's hesitant answer indicated she tried to guess what the teacher wanted to hear. The response-feedback sequence that followed, showed this episode as a form of recitation. The teacher asked the students questions to which he himself already knew the right answer.

The exploratory function of language

The exploratory function of language occurred in 17% of all units of meaning in teacher-student interactions. The function occurred most often in the first interactions with Mr. Prince. Transcript 6.5 illustrates this function.

A: Many Polish immigrants live in small rooms in the Netherlands
T: But that is not the main problem, that's their choice and they are used to it
A: Because they don't have money for something else
T: They rather spend it on other things. They want to save up as much as they can. They don't care if they are in a temporarily tight spot

A: But I think that is an important issue
N: Also for the Dutch
T: Yes
N: If there are many Polish immigrants who want to work, construction workers for instance, but the Dutch also want to be able to get jobs
T: Hmmm
N: I think at some point there is just too much demand of…
T: For whom?
N: ehm, that there are like too many people who want a particular job
A: You know what, with Polish people, they want to work for less than Dutch people
T: Yes
A: So as an employer who is looking for employees and Dutch people won't work for little money, you get Polish people and so the Dutch have no jobs

Transcript 6.5: Occurrence of the exploratory function of language in teacher-student interaction, lesson 1, Mr. Prince

Transcript 6.5 shows teacher and students in defining the main problem concerning Polish immigrants. Anna proposed as a main problem the fact that Polish immigrants live in small rooms in the Netherlands. The teacher objected that that was not a problem, but a personal choice. Anna disagreed by stating that Poles did not have the money for different housing. The teacher objected with again an argument concerning personal choice, since Polish immigrants want to save up the money. Anna however declared that she nevertheless believed that it was an important issue, with which she focused the discussion again on the question of what the main problem was. Anna did not explain her point of view, but her utterance received uptake by Nina who inferred that the personal choices of the Poles affected the Dutch, singling out a different problem. The teacher agreed with Nina's remark. Nina elaborated on her point of view by starting a reasoning on a relation between the number of Polish workers and Dutch people who also want jobs. The teacher encouraged this line of reasoning by asking questions to specify, and by making encouraging noises ('Hmmm'). When Nina seemed to lose track of her line of thought, Anne took up on it and added that Polish people want to work for less than the Dutch, which has as a consequence that Polish people are hired by employers at the expense of Dutch workers.

The exploratory units of meaning in this transcript are uttered by the students, who take up on each others' contributions and on the contributions of the teacher. The teacher's units of meaning can be characterized as challenges, in the first part of the transcript, and as encouraging questions and encouraging noises in the second part of the transcript. Most of the exploratory interaction in the teacher-student interaction was initiated and taken-up on by the students amongst each other. The teacher played a predominantly facilitating role in these episodes. Despite the teacher's facilitation of exploratory interaction, the main problem with Poles in the Netherlands still remained unclear. Students singled out two problems and addressed a number of sub-problems, however, they did not decide on a main problem on which to focus their study.

The pedagogical function of language

The pedagogical function of language in which language was used to seek and provide intellectual guidance occurred little in teacher-student interaction, with in sum 4%. The way the pedagogical function occurred in units of meaning of the teacher, as illustrated in Transcript 6.6, provided some insights into how the teacher struggled with the notion of ownership and how to shape his role as a coach. In addition, it provided an insight into how the students in their turn struggled with what exactly was expected of them. Transcript 6.6 was part of a teacher-student interaction that took place in lesson 4. The students had contacted the teacher to ask whether the teacher agreed with their approach so far, especially concerning the way they delimited their topic. The interaction started with a pedagogical unit of meaning, but shifted right after to instrumental units of meaning.

T: How did you delimit the topic? What does the delimitation look like?
M: The consequences of eh, with the Poles, why they come to the Netherlands
T: Yes, but we talked at length about it last time and then we said you have to choose a delimitation. What did you choose?
M: We are going to try to look at it from three points of view, and everyone does one point of view
T: And what are these points of view?
M: An economic, a social and a …
N: Political
M: Political consequences. And everyone gets his own part and looks from it to Poland and the Netherlands
A: No not to Poland!
N: No just the Netherlands
N: Well, in any case we have sub-questions which we worked on
T: And what exactly is your delimitation? What exactly?
A: Look here, we have -
T: No, say it to me, do not let me read it! You are the owner of this topic. You have to tell me what the delimitation is.
N: Well we have made sub-questions
T: Yes, but what is your delimitation, where do you put the focus on? How do you turn that big story of Poles, labor market, EU, where do you delimit?
N: We only look at the Netherlands
T: What in the Netherlands?
A: Well, we look at eh, we only discuss the consequences for the Poles a little bit. We write a small piece about that, a section. But we especially discuss the consequences for the Netherlands, both social-economic and political.

Transcript 6.6: Occurrence of the pedagogical function of language in teacher-student interaction, lesson 4, Mr. Prince

The teacher started this episode by asking after the students' delimitation as a form of intellectual guidance. Morat answered by articulating their research topic, but this was

not to the teacher's satisfaction. Instead of taking up on Morat's contribution, the teacher rephrased his initial question, turning the dominant function of the utterances to instrumental. In monologically oriented teacher instruction, when a teacher repeats a question after an answer is given, this means that the teacher considers the answer provided wrong. Here, too, the teacher's repetition of the question was interpreted as a disqualification of Morat's answer. Morat's second attempt, concerning 'three points of view', did receive uptake by the teacher. However, after a short discussion on the points of view concerning the research topic between all three students, the teacher asked the same question for the third time: 'And what exactly is your delimitation? What exactly?', with which he again disqualified the previous contributions. This resulted in Anna trying a different approach to arrive at an answer the teacher would be satisfied with, by showing the teacher the work they had done on paper. This however, was not at all what the teacher wanted to hear, considering his strong reaction: 'No, say it to me, do not let me read it! You are the owner of this topic. You have to tell me what the delimitation is'. In his response, the teacher explicitly formulated the aims and procedures of the work-setting they were in, which intended students to be owners of their own projects. The teacher seemed to perceive 'telling' as being owner, and 'showing' as the opposite.

The units of meaning that the teacher expressed here could be categorized as reflecting the procedural-instrumental function of language. With these units of meaning, the teacher on the one hand told the students that they were supposed to take ownership, yet on the other hand he took the ownership away from them by constructing the notion as a way to impose the proper procedure on the students. In addition, the teacher used these units of meaning in a recitative sequence of units of meaning, uttered to urge students to provide the right answer. Especially when he added the fourth rephrasing of the same question: 'You have to tell me what the delimitation is'. Nina subsequently brought up the notion of sub-questions again, however, that, too, was an incorrect answer, resulting in the teachers fifth rephrasing of his question on delimitation, this time adding an explanation of the word 'delimit'. This, finally, resulted in an answer the teacher took up on: 'What in the Netherlands?', after which Anna started to explain how they shaped their research project.

Transcript 6.6 shows how both the students and the teacher experienced difficulties in interacting with each other, which could be attributed to the occurrence of monological oriented interaction patterns and the expectations they raised. The transcript started with a pedagogical question in which the teacher asked the students to inform him about the way they delimited their research topic. The question, however, was not answered to the teacher's satisfaction. Four lessons earlier (cf. Transcript 6.5) students had distinguished a number of problems with Poles in the Netherlands that could have been the focus of their project. However, in Transcript 6.6, students still did not seem to have an idea on what exactly would be the main problem of their research.

The teacher's repetition of the question however triggered a monological oriented interaction pattern. The students considered Morat's answer disqualified, resulting in them proposing continuously different answers in finding one the teacher would be

satisfied with. The fact that they appeared to be guessing for the proper answer, convinced the teacher that students did not have a proper insight into the way they delimited their research project, and therefore did not have a sense of ownership concerning their research project. The teacher appeared to interpret Anna's attempt to show the teacher what they had written down as the ultimate lack of ownership, while for the students it seemed to be one of the possible ways to answer the teacher's question to his satisfaction.

The tool the teacher used to obtain an answer from the students was to repeat his question, a traditional recitative way of interacting. The students followed the teacher's recitative interactional style by playing the part students traditionally play in this kind of interactions.

The conflict between monologically oriented and more dialogically oriented use of language, which this transcript illustrates, could be considered an important characteristic of teacher-student interaction. The interactions showed that both parties had difficulty with the new way of interacting that the collaborative learning situation asked for. The teacher tended to shift habitually to more monologically oriented interactional styles and the students followed the teacher's lead.

6.5 Student interaction

6.5.1 On-task and off-task interaction

In answering the question 'Which functions of language can be observed in student interaction in collaborative learning and can this be related to the instruction students received?', I first counted on- and off-task student interaction. On-task interaction consisted of units of meaning concerning the four on-task topics distinguished in Section 6.3: The setting, methodology, the research subject and writing. Off-task interaction consisted of interaction that did not concern the task. Table 6.6 shows both the division in on-task and off-task interaction and the frequency with which the conversational topics occurred in the eight lessons and in sum.

Table 6.6: Percentages of on-task and off-task interaction in student interaction in lesson 1-8

	1 N=643	2 N=1,256	3 N=794	4 N=712	5 N=855	6 N=405	7 N=658	8 N=411	SUM N=5,734
Setting	37	29	41	26	17	18	27	18	28
Methodology	22	30	–	12	7	–	3	1	11
Subject	19	11	20	34	41	–	23	2	21
Writing	2	14	–	10	3	–	35	17	10
On-task	81	69	61	81	68	18	88	38	70
Off-task	19	17	39	19	32	82	12	62	30

As Table 6.6 shows, student interaction was predominantly on-task with 70% of all units of meaning. The division was more or less similar in the individual lessons, except for

lesson 6 and 8. In these two lessons students spent most of their time working on the computer, finishing the individual parts of their research report. The three students were working at different locations in the school. The recordings focused on Anna who only occasionally interacted with neighboring students. These neighboring students were not part of the groups she worked with, the nature of this interaction was therefore predominantly off-task. In the other lessons, students showed two situations in which they interacted off-task. The first was at the end of each lesson, which was perhaps due to the students' attention span. The second situation was when unexpected things happened, for instance when someone dropped something.

Table 6.6 furthermore shows the percentages of the topics discussed within on-task interaction. The specifics of the setting the students were in, were most often discussed with an average of 28% of all units of meaning, just as in the teacher-student interactions. This topic concerned the rules and regulations of the collaborative learning setting and everyday matters like where to work and what project to work on during that lesson. In discussing this topic, students constructed shared aims and opinions concerning their project, both on an everyday level and on a more general level.

The frequency of discussion of the four topics differed per lesson, and showed the students primary activity throughout their project. Students started out by discussing both the setting and methodological aspects of their study in the first two lessons, as can be seen from the high frequencies in both topics. In these lessons students primarily shaped their research questions and their research design. In lesson 3 to 5, the research subject, Polish immigrants in the Netherlands, dominated the interaction. In lesson 6 students worked individually on the computer, hence the 82% off-task interaction. In lesson 7 and 8, students focused on discussing the written texts and again worked on the computer to merge the three individual texts.

6.5.2 Occurrence of functions of language

Table 6.7 shows the percentages of the functions of language observed in student interaction in collaborative learning, both per lesson and in sum concerning only the on-task interaction.

Table 6.7: Percentage of functions of language in student interaction in lesson 1-8

	1 N=524	2 N=810	3 N=483	4 N=585	5 N=582	6 N=62	7 N=578	8 N=1571	SUM N=3781
Exploratory	9	11	2	29	23	–	15	–	14
Pedagogical	–	–	–	3	1	–	3	–	1
Instrumental	75	75	59	61	65	71	73	81	69
Social	16	15	40	8	11	19	8	19	16

As Table 6.7 shows, the observed functions of language did not vary much per lesson. The instrumental function generally occurred by far the most often with 69%, varying from 59% in lesson 3 to 81% in lesson 8. The social function of language occurred the

second most often, with 16%. In all lessons this function occurred in more or less the same percentages, but lesson 3 stood out with 40%. Students were searching sources for their project on one computer in that lesson, and many affective remarks were made to each other concerning the search process. The exploratory function took up 14% of all on-task units of meaning. The occurrence of the exploratory function varied per lesson, from 0% in lesson 6 and 8 to 29% in lesson 4. Finally, the pedagogical function of language hardly occurred, with in sum only 1%. The pedagogical function of language occurred in three lessons, one in each episode. In the following sections, the occurrence of each function in on-task interaction is discussed in more detail, starting with the social function of language.

Social function of language

The social function of language in on-task interaction occurred when students addressed their personal lives and personal opinions when discussing task-related matters, for instance when students discussed their week schedules when planning project activities, when students discussed their opinions on the project they were working on and on the guidance they received. Despite the fact that the collaborative learning setting students worked in was not new, students still experienced difficulties understanding the rules of the situation. Students discussed the setting in general, for instance concerning its aims, the responsibilities of teachmasters and workmasters and the question of how their final grades would be influenced by the grades they would receive on the different research projects. In addition, students also discussed their opinion on the situation at hand. Students for instance discussed the teacher's guidance, as Transcript 6.7 illustrates. In this transcript, the students expressed their hesitation to discuss their progress with Mr. Prince.

N: Okay, shall we first discuss this with the teacher and see if he thinks this is okay?
A: No… You know what it is with Prince? Prince always spoils things
N: Yes, he kinda does
M: How come?
A: Every time you present an idea, he talks so much that you start to think your own ideas are stupid
M: Then you just have to say 'no'
N: Yes, that is true. Anna, if we just say to him that we don't have time to discuss it at length, but that we don't know whether we have a proper delimitation
A: Yes we could do that…

Transcript 6.7: Occurrence of the social function of language in student interaction, lesson 2

Transcript 6.7 shows a discussion concerning the question whether the students should check in with Mr. Prince, to see if he approved of the research design they constructed. Nina's proposition in the first line resulted in a short interaction concerning the way the students experienced the guidance of Mr. Prince. Anna started by articulating that in her perception Mr. Prince always 'spoiled things'. Nina agreed, after which Morat asked

for an explanation of this characterization. Anna subsequently explained her experience with interactions with Mr. Prince. Using rather universal terms like ‘every time’ and the general ‘you’, Anna argued that Mr. Prince talked ‘so much’ which made her feel that her ideas were stupid. Morat reacted by proposing a strategy to cope with the teacher: ‘Then you just have to say ‘no’. Nina agreed to that, but altered Morat’s strategy by proposing to only put the delimitation up for discussion with a time-related excuse. To this Anna hesitantly agreed.

A central issue in this episode was Anna’s characterization of the teacher’s way of interacting as ‘talks so much that you start to think your own ideas are stupid’. As could be seen in Section 6.4, the teacher indeed talked ‘much’ in the sense that the teacher’s interaction often showed the instrumental function of language, both in the content-related and in the procedural mode. This resulted in monologically oriented instruction. The units of meaning Anna uttered in Transcript 6.7 could be interpreted as Anna expressing that the teacher’s tendency to tell them what to do made her feel that her own ideas concerning the project were not valid. She felt not heard in teacher-student interaction.

Morat apparently had little experience with the point Anna made. Nina however seemed to agree with Anna’s assessment. The proposition Morat made concerning how to deal with the teacher’s behavior implied standing up to the teacher’s way of making Anna’s ideas seem invalid, by simply refusing. Nina’s agreement could be interpreted as an agreement to Morat’s intention to stand up to the teacher, but not to his particular strategy, considering the fact that she proposed a different and more specific one. Her strategy implied diminishing the teacher’s chances to start ‘talking so much’ by presenting their question for guidance as a straightforward right or wrong question, whether the delimitation was proper or not, accompanied by an excuse that concerned a lack of time for ample discussions. To reduce the chance of not being heard, Nina proposed a strategy in which the teacher would not be heard. As a solution to their perceived problem, Nina proposed to mirror the teacher’s way of interacting.

Instrumental function of language

The instrumental function of language occurred rather often in student interaction in collaborative learning, with an average of 69% of all on-task units of meaning. The instrumental function of language is generally used to get thing done, and was subdivided into a procedural mode and a content-related mode. The first mode concerned the establishing of proper procedures and courses of action. The second concerned the mere exchange of meaning concerning the conversational topics distinguished in the analytical framework, being the collaborative learning setting, methodological aspects, the research project and writing.

Table 6.8 shows the frequencies of occurrence of the two modes. The procedural mode occurred most with about two thirds of all instrumental units of meaning. The content-related mode occurred in about one third of all instrumental units of meaning.

Table 6.8: Procedural and content-related modes of the instrumental function of language in lesson 1-8 (in %)

Instrumental mode	1 N=384	2 N=605	3 N=282	4 N=364	5 N=384	6 N=50	7 N=425	8 N=127	SUM N=2,621
Procedural	52	60	–	58	66	95	69	79	65
Content related	48	40	–	42	34	5	31	21	35

The procedural mode occurred quite often. Considering the fact that students interacted instrumentally in about 70% of all units of meaning, this implies that the total percentage of procedural-instrumental units of meaning in all student interaction in collaborative learning was about 45%. Students uttered procedural-instrumental units of meaning especially in coordinating their actions and in dividing the work. Students talked at length about who should do what, where to work, when to work and what to do that lesson, as Transcript 6.8 illustrates.

M: Where do you want to sit?
A: Yes, we have to sit somewhere we can talk, because we need to eh we are dividing everything right?
N: Yes we eh
A: The specific sub-questions
N: Yes
A: Shall we go sit in the auditorium?
M: They all have class downstairs and the library is completely stuffed, I just checked
N: Are you sure? Oh…
A: Than we will move to the auditorium

Transcript 6.8: Occurrence of the procedural-instrumental student interaction, lesson 3

Transcript 6.8 shows how students coordinated action both on an everyday level in where to work, and on a project level in articulating the fact that they needed to divide the specific sub-questions. The research project as a whole was not approached by the students as a collaborative effort. The students collaboratively constructed a research design which could be carried out individually. They constructed three sub-questions, so every student could work on his own part of the project, without needing the direct input of the others in their work. This resulted in each student conducting his own study and writing his own sections of the research paper.

The content-related mode occurred in 35% of all instrumental units of meaning. This mode occurred in discussions concerning all on-task topics that were distinguished in Section 6.3. These discussions were characterized by the exchange of meaning using statements and counter-statements. Content-related instrumental discussions often resulted in answering the question of which procedures to adhere to. Transcript 6.9 shows a discussion on how to define the introduction in terms of the research design. The question that was central in this transcript was the question of how to deal with the

introduction in terms of coordinating action. Students divided the work in writing the research report. In Transcript 6.9 this way of working conflicted with a definition of the word 'introduction'. In interactions with Mr. Prince, the introduction appeared not to be a more or less straightforward way of telling the reader what the paper would be about, but to entail quite a bit more, both in terms of written content and in amount of work. The question that arose was what this would mean for the division of the work and whether this would turn the introduction into a sub-question, since the notion of 'sub-question' was to the students synonymous with 'dividable part of work'.

A: I think this is a sub-question
N: No, it is an introduction, not a sub-question. They don't treat this as a sub-question. It is just providing information on the subject.
A: I think Mr. Prince said this was just a sub-question
N: No, with my other projects it is done like this. Look, I have introduction, then sub-question 1, sub-question 2 and sub-question 3.
A: That is a lot of work
N: Yes, it is a lot of work. Now, for the introduction.

Transcript 6.9: Content-related instrumental student interaction concerning the conversational topic writing, lesson 2

Transcript 6.9 started with Anna defining the introduction as a sub-question. Nina challenged Anna's statement and added two arguments to her challenge. The first was procedural-instrumental by putting forward a faceless authority who characterized it differently: 'They don't treat this as a sub-question'. The second was of a more exploratory nature and contained an elaboration on the definition of the concept 'introduction' by stating that an introduction provides information on a subject. Anna counterchallenged Nina's challenge by referring to another authority, being Mr. Prince, who she believed had said that the introduction was a sub-question. To convince Anna, Nina referred to her other projects, in which the introduction was not regarded a sub-question. This apparently convinced Anna, since she characterized that way of working as 'a lot of work', after which Nina went back to business: 'Now for the introduction'.

Nina's referral to her other projects was apparently a convincing argument. The research projects were guided and approved of by teachers, and since neither of these apparently had frowned upon the introduction not being a sub-question, it was probably the correct way to approach the introduction. This discussion was solved by the proposition of authorities. Anna's reference to Mr. Prince as an authority did not win the discussion, which could be due to her hesitative 'I think', which made it questionable whether Mr. Prince had actually said it. Students dealt with this and other content-related questions as conflicts between different authorities. The authority figure who appeared to hold the most authority in the matter was followed. The content-related reasons behind these matters were rarely addressed.

Exploratory function of language

The exploratory function of language was observed in 14% of all units of meaning. Most exploratory units of meaning occurred when students discussed text-conventional matters, like what information students should write down and where to write it down. Episodes in which the exploratory function occurred were rather long and many exploratory remarks received uptake. Students kept the aim of the interaction in mind however, by always translating the constructed knowledge into more practical notions such as what to write down. In Transcript 6.10 Anna and Nina discussed the text Nina had written.

A: Look, here you contradict yourself: 'Most of the money they make in the Netherlands is sent back to Poland and is not spent in the Netherlands.' (turns pages) 'Based on this I conclude that it is good for the economy'
N: Well, I do. Because the companies are getting richer, right? Workers who work for those companies… and what they spend is only a small part of what in the Netherlands.'
A: Yes but still, 150,000 Poles!
N: On the one hand they say that the economy is reviving, right? Economic revival.
A: Hmmm
N: They did say that the economy is reviving, right?
A: Yes, look, the government, like many political parties say Poles are good for economic growth. Then the people say: how come its good for economic growth? They don't even spend their money in the Netherlands
N: Yes, but you say that it is a contradiction between peoples opinions, people versus political parties. But it is not the case that all political parties…
A: No, but now, how do we write it down?
N: Yes but if you look at all the money those companies make, they keep getting richer because the Polish people work for so little money.
A: Yes but still, then we have to remove this entire section
N: So these companies earn more and more. No, don't take that section out!
A: No, I won't, but still
N: No, we don't have to take that section out, cause its good. We just have to add a section.

Transcript 6.10: Exploratory function of language in student interaction interrupted by procedural instrumental units of meaning, lesson 7

Transcript 6.10 started with Anna commenting on a part of the text written by Nina. She believed Nina contradicted herself by writing that Polish people did not spend their earnings in the Netherlands, and at the same time concluding that the Dutch economy had grown due to the presence of Polish workers. Nina responded by constructing a line of reasoning in which she advocated that the disappearance of the earning of 150,000 Polish workers did not affect Dutch economy in a negative way, since the earnings of the companies that hire these workers were much bigger due to the Polish workers. Anna objected by referring to the large number of Poles in the Netherlands. Nina subsequently started a line of reasoning concerning the alleged economic revival. Anna however did not seem to accept Nina's remark. Nina repeated her line of reasoning

explicitly ending with a request for confirmation 'right?'. Anna responded by repeating her original statement, but this time attributing the statement to a combination of political parties and 'the people'. Nina rephrased Anna's utterance and started to nuance the statement Anna made by elaborating on political parties.

Her line of reasoning was interrupted by Anna with a procedural unit of meaning, in which she disregarded Nina's units of meaning: 'No, but now, how do we write it down?' shifting the focus of interaction to the procedure to be followed. Nina however still continued her line of reasoning: 'Yes but if you look at all the money those companies make, they keep getting richer because the Poles work for so little money.' Anna again shifted to the procedure, stating consequences of Nina's argument for the research paper they had written: 'Then we have to remove this entire section!'. Up to Nina's first subsequent unit of meaning 'So these companies earn more and more money', both students seemed to follow their own line of discussion, without reacting to each others' remarks. Only when Anna apparently did something on the computer, did Nina react procedurally by arguing that she should not take that section out. Anna agreed, after which Nina entered the procedural mode introduced by Anna: 'No, we don't have to take that section out, cause its good. We just have to add a section.'

As Transcript 6.10 shows, the exploratory function of language initially received uptake. Anna asked for clarification and Nina elaborately clarified her opinion. The first half of the transcript could be characterized as an exploration into the question whether the Poles were responsible for economic growth or not. Nina thought they were, but Anna did not understand how she could conclude such a thing based on her text. About halfway into the episode, Anna's focus shifted from the content-related matter of the Dutch economy to the more procedural matter of how this content had to be presented in their text. Anna's introduction of the procedural focus was quite abrupt. She interrupted Nina who was still explaining her point of view concerning economic growth. Nina however kept following her line of reasoning, after which Anna again focused on the procedure.

This episode shows what role the procedure played in student interaction. The moment Anna had heard enough of Nina's line of reasoning to draw conclusions for their product, she started to translate Nina's contributions as consequences for the product. Nina's exact line of reasoning did not seem as relevant to Anna as the consequences it had for their paper. Although the exploratory function of language received uptake in almost all instances, the focus of the exploratory discussion eventually always shifted to the product that had to be delivered. Knowledge constructed in an exploratory way was interpreted in terms of the final product, in this case at the cost of fully understanding each others' points of view.

Pedagogical function of language

The pedagogical function of language occurred rarely in student interaction with an average of only 1%. Only in a handful of instances did some form of intellectual guidance between students occur. In view of the situation, this may not seem very remarkable. The aim of the project was for students to construct knowledge together,

not to guide each other into new knowledge. However, in view of the fact that students mostly divided the work, resulting in students becoming experts in their personal area of research, it is still noteworthy that the pedagogical function of language did not occur more often. The pedagogical function never concerned the research subject, but rather methodological and writing aspects concerning practically applicable knowledge, like how to quote. Transcript 6.11 illustrates the latter.

A: Here political parties express their views. Look, I just read this part to you, this FNV
M: That labor union
A: Look, you can do something with this, see. You can say, uhm, you type a sentence on your opinion and then you say: see attachment. Then you quote something from a section like this and we put it in the attachment. And then you say: see attachment five. And then that is the proof that you don't talk nonsense, but that you have it from someone else.
M: (nodds)
A: Do you understand?
M: Yes

Transcript 6.11: Occurrence of the pedagogical function of language in student interaction, lesson 5

In Transcript 6.11 Anna explained to Morat the principles of quoting, as she understood them. Anna could be considered an average achieving student, and Morat a lower achieving student. The role of more knowledgeable peer was assumed by Anna. She not only verbally explained quoting, but also showed Morat on the computer screen how quoting was done and checked with Morat whether he understood her explanation. Morat did not really react to Anna's explanation. This type of episode never encompassed school subject aspects; only relatively small pieces of information concerning methodological or text related aspects that usually involved the use of the computer.

6.6 Conflicting perspectives

The third question was 'Do students verbally construct knowledge in collaborative learning and can this be related to the instruction they received?' As the previous section showed, the instrumental function of language was the function that occurred most often. The functions of language associated with the verbal construction of knowledge, the pedagogical function and the exploratory function, did both occur as well. The pedagogical function occurred rarely with an average of only 1%. The exploratory function of language occurred more often with an average of 14% of all units of meaning. However, compared to the occurrence of the instrumental function of language, functions of language in which knowledge was constructed were still not very common. In answering the question whether students verbally constructed knowledge, I also studied situations in which conflicting perspectives arose. In this section I will discuss three of these episodes.

6.6.1 Conflicting perspectives on instruction

Transcript 6.13 shows a conflict of perception concerning the teacher's instructions. In this case the conflict was not about what knowledge to incorporate, but about what procedure to follow and why. The discussion in Transcript 6.13 was sparked by a remark the teacher made to Anna in a previous lesson, concerning the introduction of the students' research report. Transcript 6.12 shows these units of meaning.

T: So, I would look at this area, and then you outline in one and a half page how those Poles got here, what preceded it and what it means. So that is outlining, it does not have to be that long.

Transcript 6.12: Procedural-instrumental teacher-student interaction, lesson 1, Mr. Prince

The teacher's remark in Transcript 6.12 concerned an explanation of the word 'outline' and how it related to the introduction, uttered in procedural-instrumental units of meaning. The teacher laid out what the introduction should concern, a historical outline of the presence of Poles in the Netherlands, in terms of what Anna should do: outline it in one and a half page. He added that 'It does not have to be that long'. This latter comment on the length of the section made the 'one and a half page'-comment more of an illustration on the shortness of the outline, than an instruction on the precise length of the introduction. However, as Transcript 6.13 shows, students took his remark to heart when they discussed the outline of their introduction.

N: But the introduction does not have to be very long, right?
A: No, you don't understand, this common part has to be one and a half page
N: Well, then you just make a sub-question out of it
M: One and a half page?
A: That's what I said
N: But then you shouldn't put this information in the introduction
A: No, that's what you just said. It is an introduction to the subject, not the introduction of 'we are gonna do our project on…
N: Then you should turn it into a sub-question
A: Yes this is a sub-question. This is number one. Mr. Prince said: just write one and a half page on the facts.
[…] (*short discussion about copy-pasting facts, see Transcript 6.14*)
A: No I meant just that Mr. Prince said to explain how it happened that more Poles - that the borders were opened, how they came to the Netherlands
N: (*Points at a source on the Internet*) Look here, you can use the specific part of opening the borders, just the part on the EU, not everything that's in it
A: Yes, I don't know how you can get one and a half page using this. I'm sure you won't get one and a half page.
M: You can discuss when the borders opened up and Poland joint the EU, in just ten lines or so
[…]

A: But look! You can say what you want, but Mr. Prince said one and a half page! Just make ten lines, just do it. But then he will say: I said this and this. Didn't you listen? No we didn't listen, cause we'd rather do it our own way! Fine! He said one and a half page? Are we gonna do it? No. Listen, he -
N: But we have to do what is the most important
A: - I was on the computer, I was showing him the sites and he said, yes make it an introduction to the report, it just has to be one page and a half. Mr. Prince even thought that was little. I showed him the websites and then he said one page and a half!
N: So this isn't a sub-question?
A: We can leave it out completely, I don't care
N: No, not that! I wouldn't leave it out, but I would have made it shorter. Or perhaps everyone writes a piece of it. We could do that.
A: Look, in Brussels it was decided that the borders of the Netherlands should be opened. That was decided in Brussels, there were conferences about that. The Netherlands have thought about that kind of stuff. Cause you know what it is?
M: I am sure that there is a newspaper article about it
A: If we leave this out, then why the Netherlands?
N: We can't leave it out, but I thought, maybe we can shorten it and leave out all the details and just state very briefly how come the borders are open
M: There sure will be a newspaper article about that, about how it came about. The Volkskrant probably. You are allowed to put that in.
A: Yes a newspaper article is
N: But you have to, in a way…
A: Yes, under that you have to…
M: You can put a short section under it with what you think about it
A: No not what you think about it
M: Work it out
A: Opinions are not important
M: Discuss it yourself
A: Yes, discuss it
M: If we use this source, it doesn't have to be that much work. Then maybe we will get one page and a half. One page on the EU and half a page discussing a news paper article.
A: Yes, I think that's a good idea, that news paper article. But then you'll have to find one
M: I will

Transcript 6.13: Conflicting perspectives concerning the instruction in student interaction, lesson 2

In Transcript 6.13, students discussed the implementation of the procedural remark the teacher had made concerning the introduction: 'and then you outline in one and a half page how those Poles got here'. The teacher only mentioned the one and a half page-part once, but especially Anna took it very seriously. In the transcript she advocated the implementation explicitly, even referring to the consequences the teacher had mentioned when he had laid out other procedures in the teacher-student interaction, like a negative evaluation.

The transcript shows different references to the procedural remark of the teacher concerning the length of the introduction. Anna started with advocating the procedure as more or less her own opinion on the length of the introduction: 'That's what I said'. Nina inferred that the introduction therefore did have to be a sub-question. One and a half page appeared to be too long of a text to write collaboratively, and after a short challenge and counterchallenge between Morat and Anna, Nina subsequently inferred content-related consequences, being that certain information did not belong in the introduction. Anna defined the nature of the introduction, explicitly referring to Nina's previous remark: The introduction should introduce the research subject. Nina again drew procedural conclusions by attributing the status of an individual task to the introduction, by proposing it to be a sub-question. Anna agreed to Nina's proposal.

After a short discussion on the general acceptance of copy-pasting (cf. Transcript 6.14) the topic of the student interaction shifted to the question of how to fill up one and a half page with text. Nina proposed to use a certain source, but Anna believed that that particular source would not result in one and a half page of text. Morat proposed to discuss the matter 'in just ten lines or so'. Anna strongly disagreed with this proposal, explicitly referring to Mr. Prince's instruction concerning one and a half page and the consequences Mr. Prince had laid out in general when they would refuse to follow his instructions. Nina however objected that they had to do what was the most important, implying that there were things that were more important than Mr. Prince's instruction. Anna disagreed by explicating the precise situation in which Mr. Prince had told her to make the introduction one and a half page. Nina subsequently made an inference concerning the division of work by asking whether the introduction would be a sub-question. Anna seemed to feel that her advocating Mr. Prince's instruction did not receive uptake by her fellow students and declared that she did not care anymore and that the part could be left out all together. Nina tried to compromise on the procedural demand by proposing a procedure to deal with the problems the demand constructed: By either making the introduction shorter or by dividing the introduction between the three of them.

After Nina's procedural compromise, Anna shifted the conversational topic to the content of the introduction and the content-related consequences of leaving the introduction out of the research paper. Nina agreed with Anna's assessment, but again advocated her procedural compromise of shortening the introduction. Morat added another procedural solution, by declaring that a newspaper article would be available on the topic, implicating that this would take up a considerable amount of page space, and that a newspaper article would be allowed in an introduction. In a number of sequences Morat and Anna established that some discussion had to be added below the article. Morat concluded that that course of action would not be that much work, and would result in one and a half page, when combined with information on the EU. Anna agreed, on the condition that he had to find such an article.

The conflict that occurred in this episode could be interpreted as a conflict concerning which procedure to adhere to. The teacher had mentioned that the introduction should outline the background of Polish immigrants in the Netherlands in one and a half page.

The instruction was both content-related and procedural. The procedural aspect of the instruction could be regarded an illustration of the fact that the outline concerning the Poles did not have to be that long. To the students, however, one and a half page appeared to be an enormous amount of written text.

The student interaction that followed was not about how to present this background information or what the introduction should precisely contain, but on three procedural matters. The first matter was whether or not to actually follow the teacher's procedural instruction concerning the length of the introduction. The second matter was how to carry out the amount of work a one and a half page instruction would entail, either as an individual task of one student or as a collaborative effort of the entire group. The third matter of discussion was how to fill one and a half page with enough text.

The students, especially Anna, perceived the instruction of the teacher as an instruction into the proper procedure, which had to be followed. Nina and Morat appeared to be more open to not applying the procedure laid out by the teacher, which caused Anna to advocate the teacher's point of view as she understood it with even more vigor. The teacher had indeed mentioned the aspect of one and a half page, although it could be debated whether this was intended as strict as a procedural requirement as Anna interpreted it. The teacher had also mentioned other aspects of the introduction, like what information it should contain and what purpose it should serve. However, the procedural part of the length of the introduction became the subject of discussion.

The teacher's interactional style in his utterance could be characterized as monologic: It concerned a transmission of information in procedural-instrumental units of meaning. The teacher's general way of interacting presented instructions as quite strict requirements, which did not leave much room for student contributions. In addition, her argumentation Anna referred to earlier interactions in which Mr. Prince had made clear what the consequences would be if students failed to follow the procedure he laid out. In view of the general way of interacting of the teacher, it could be argued that Anna interpreted the teacher's instruction as an outline of required procedures of which the most procedural part was most important, and to which no concessions could be made. The instruction of the teacher, which also addressed content-related elements concerning the nature of an introduction, therefore only received uptake concerning the procedure and resulted in a procedural discussion in which language was used as an instrument to finish the task.

6.6.2 Conflicting perspectives on procedures

Transcript 6.14 shows the episode left out from Transcript 6.13. This episode concerned the question whether it was allowed to copy-paste information when writing a research report. Morat started the discussion by stating that facts could be copy-pasted.

M: Yes, but facts you can just copy paste
A: Yes, but that is not allowed
M: Of course it is

A: No it is not
M: You can copy-paste facts
A: Morat, if I make a report on the bio-industry…
M: - No, the introduction
A: …I am gonna make stuff up myself
M: yes you can
A: No Morat! I am getting stuff from the Internet to put in my own words. I can't just copy paste
N: You never do that in History
A: Maybe with your other project, but here you are not allowed to copy paste

Transcript 6.14: Content-related-instrumental student interaction, lesson 2

In the first units of meaning, Morat expressed his belief that facts could be copy pasted, implicating with the word 'could' that the copy-pasting of facts was something that was generally accepted in the context of their work. Anna agreed with Morat's statement that facts could be copy-pasted, but added that that was not allowed, which was followed by a yes-no sequence. After Morat's third statement that copy-pasting was generally accepted, Anna used a different approach by attempting an if-then reasoning on what Anna would do when writing a hypothetical report on the bio-industry. Morat interrupted her reply by specifying that copy-pasting was allowed in the introduction of a report. Anna however finished her sentence by declaring that she would make stuff up herself. Although Anna's perspective shifted towards what she herself would do concerning the copy-paste issue, Morat's subsequent utterance turned the sequence into again a yes-no argument.

The contribution of Nina that followed held a certain argumentation: 'You never do that in History'. With this statement she gave an argument based on authority. The general values of the school subject History dictate that copy-pasting is not allowed. Anna took up on this argument, by declaring that in other projects copy-pasting might be allowed, but not in this one.

The discussion concerning copy-pasting was conducted in terms of procedures that should be adhered to in that situation. The students did not address possible content-related reasons for not copy pasting. The matter was discussed as if these procedures were not something that could be understood or something for which there could be a reason. They were discussed as if the prohibition on copy-pasting was a natural law for which there was no argumentation. The law could apparently differ per school subject, but these differences were treated as arbitrary. Students appeared to perceive content-related conflicts as conflicting procedures between different authorities. Dealing with these conflicts therefore primarily implied discovering which procedure of which authority applied. Just as Transcript 6.9 showed, conflicting perspectives on content-related matters were solved by referring to authority figures. This way of conflict solving seems to indicate a perception of knowledge in which knowledge consists of unchangeable facts, which do not need to be understood, only known.

6.6.3 Conflicting perspectives on authority

The concept of authority played an important role in student interaction. Student interaction often consisted of references to the authorities, both as a form of argumentation and as a validation of their actions. Mr. Prince had stated in this interaction that the students' delimitation concerning a social, an economic and a political perspective would not do justice to the complexity of the problems concerning the Poles in the Netherlands. Instead, he advocated a perspective on micro and macro-level concerning individual problems. In Transcript 6.15 students interacted about the design of their research after the interaction with Mr. Prince.

N: Morat, you look troubled
M: (mumbles)
N: Yes, it is a difficult topic, but it is correct now
M: Now the topic has changed again, now you guys are going to look at it from yet another perspective
A: No, macro only concerns this point, right?
M: (mumbles)
A: Look, we can create a separate section on economics, but that takes us back to where we were before. So I think we better start with on macro level they say this and this and on micro level these problems occur
N: Really? But I think mister has put us a little on the wrong path. Because I thought our division in economic, social and stuff was actually really good. But Prince says we have to do it like this.
A: Yes
N: Well, that's what its all about, right? But I think this division is much more difficult.
A: Yes, I think so. But I've already implemented it.
N: Wait, we can show him what we have now
A: Yes
M: But who does what now?
N: I do think with Mr. Prince, what you said, that he always talks so much
A: He does, right? It is so annoying.
N: Because if we show this, he'll probably say something different again.
A: See Morat, we are gonna do this entire section together. After the section on criminality I still discuss the social problem and you still discuss the economic problem. At least as much as possible, because with some problems the economic aspect does not play a role.

Transcript 6.15: Conflicting perspectives on delimitation in student interaction, lesson 4

Transcript 6.15 started with Nina addressing Morat concerning his facial expression. Morat answered by mumbling something inaudible. Nina agreed that the topic they were working on was difficult, but that now they were working on something that was correct. The word 'correct' could be interpreted as the fact that now the students were working on something to which the teacher had agreed. Morat however appeared not to be happy with this turn of events, since this entailed that the students again were working with a different approach. Notable is his use of the words 'you guys'. This

indicated that Morat did not feel as part of the group, or at least not as someone who took part in the decision making process. Anna nuanced his objection to the change the research design had undergone, by distinguishing that looking at macro level would only affect one point of his part of the project. Morat's objection was again inaudible.

Anna however took up on his objection by outlining the consequences of creating a separate economics section: It would take them back to where they were before their interaction with the teacher. With these units of meaning she implied that she believed this change of perspective was an improvement of their research design. Anna suggested that they could better start with outlining the micro and macro perspective, which their interaction with the teacher had resulted in. Nina, however, did not fully agree with the assessment of the teacher. She believed the teacher had put them slightly on the wrong path, since she thought their division in social, economic and political was already good. She ended her analysis by articulating that Mr. Prince wanted it like this, to which Nina subsequently added: 'Well, that's what its all about right?'. With this series of units of meaning, Nina expressed an important aspect of this episode. Students focused on executing the teacher's wishes, because that was what their work was about, even if they themselves did not fully agree. Anna indicated to already have a distinction similar to what they had discussed with the teacher.

Nina suggested to discuss the work they did up until that moment with the teacher, to see what he would think about it. Anna agreed. Morat added a remark concerning a more procedural point, being what the division in work would be now. His utterance did however not receive immediate uptake. Nina instead took up on her own suggestion to talk to Mr. Prince, stating that she agreed with Anna's assessment of Mr. Prince's way of interaction she had made some lessons before: Mr. Prince did indeed talk much. Anna agreed and added that she found it to be an annoying habit. Nina inferred that the result of discussing their progress with the teacher would therefore probably result in yet again different instructions. After this remark, Anna took up on Morat's procedural question concerning the division of the work, explaining that they were going to do an entire section together, instead of individually. After this section however, they would still work on individual sections.

This episode showed some disagreement between the students, but this did not result in a content related discussion. Morat was not very happy with the change of perspective, since this would result in yet another course of action. In addition, he also seemed slightly disengaged from the project, considering his use of the word 'you' instead of including himself in the student group. Nina seemed to agree with Morat. She believed their first delimitation was much less difficult. They both expressed their feelings towards the alterations, but this did not spark a discussion on the effects these would have. The necessity of the alterations was articulated in Nina's statement concerning the instructions of the teacher. Students followed the teacher's instruction carefully, in this case not because they perceived these instructions as reasonable alterations to their project, but because following the teacher's instruction was 'what it was all about', as Nina put it. Doing as the teacher said appeared to be a dominant aim in the students' efforts.

As the final sequences showed, Nina and Anna again described the teacher's way of interacting as 'talking so much', indicating to experience difficulty in perceiving coherence in the teacher's utterances. To initiate an interaction with the teacher would have an unpredictable outcome to the students. Based on their previous experiences, an initiation of interaction would probably lead to yet another course of action to be undertaken: 'He'll probably say something different again'. This unit of meaning expressed the students' perception of the teacher's instruction. Students perceived the instruction of the teacher as instructions that had to be followed, but in which no comprehensible logic, reason or predictability existed. They experienced little control concerning their interactions with the teacher.

Transcript 6.15 suggested that the students followed the instructions of the teacher, but these instructions were not imposed on the students as the interaction in Transcript 6.15 would suggest. Transcript 6.16 shows the interaction between Mr. Prince, Anna, Nina and Morat that preceded Transcript 6.15. The teacher had indicated that the delimitation in three areas of interest would not do justice to the integratedness of the problems that concerned Polish immigrants in the Netherlands. Anna made a suggestion that could solve the issue.

A: Sir, can't we just address some problems
T: Yes
A: We pick a few. See, all of them is way too much
T: Yes, okay
A: The big ones, you know what I mean
T: Yes, yes, yes
A: And from there see from what perspectives they can be looked at
T: Yes, that angle, that point of view
A: And then look per problem
T: Yes exactly, because it is a kind of social studies then, isn't it? A bit of what are the occupation and what are the interests?

[…]

T: Well, distinguish the problems that play a role now and make clear that there is a macro micro story taking place. Make clear that there are contrasting interests and ehm we end with a sort of conclusion in which you state how you think it is going to develop.
A: So you don't mind that we do not divide it precisely as economic, social and political?
T: Well, it is good to mention it…
N: So it is not so bad to…
T: To mention it in your paper and what aspects are attached to it and that they are all in conflict with each other, especially since it is macro micro

Transcript 6.16: Teacher-student interaction concerning the delimitation, lesson 4, Mr. Prince

Anna suggested to delimit their study by discussing several problems, instead of global areas. Her suggestion was taken up by Mr. Prince, who approved of this point of view.

Mr. Prince added that this delimitation would turn the research into belonging to the domain of the school subject of Social Studies. After a few social remarks concerning personal experiences with the Poles, indicated by the bracketed dots, the teacher summarized their interaction in the form of an instruction: 'Well, distinguish the problems…'. In these procedural-instrumental units of meaning the teacher took up on Anna's suggestion to delimit by discussing problems. He added macro and micro perspectives and contrasting interests concerning the Poles that were not elaborately mentioned before. Anna asked the teacher whether he approved of the fact that their previous distinction between social, economic and political would not be carried out, which the teacher approved of with some nuances.

This episode showed that the teacher's instruction was not formulated as rigid as the student interaction in Transcript 6.15 seemed to indicate. The teacher did use procedural-instrumental interaction to instruct his students, but this instruction was based on the discussion he had just had with the students. The instruction was not imposed on the students without student contribution, but was to a certain extent a mutual construction. The students' way of interacting regarding the teacher's instruction could indeed be interpreted as following the teacher's instructions, however could not solely be attributed to a procedural focus of the teacher. Students seemed to experience authority even when authority was not explicitly part of the instruction.

6.7 Conclusions and discussion

6.7.1 Conclusions

In this section I will draw conclusions based on the findings presented in this chapter. My central question was:

> What aspects of teacher and task instruction influence students' language use in collaborative learning as compared to seatwork?

To answer the central question, three questions were formulated:

1. Which functions of language can be observed in teacher and task instruction on collaborative learning?
2. Which functions of language can be observed in student interaction in collaborative learning and can this be related to the instruction students received?
3. Do students verbally construct knowledge in collaborative learning and can this be related to the instruction they received?

This chapter starts with answering these questions, followed by an answer to the central question.

Instruction on collaborative learning

The first question to be answered was: 'Which functions of language can be observed in teacher and task instruction on collaborative learning?'. The written task instruction was limited. The language use was predominantly procedural-instrumental in nature in providing a general outline of the work students should be conducting during project hours. The questions of what to work on and how to work were left for the students to answer. In this respect the task provided students with a large amount of freedom and autonomy. The specifics of every task were constructed by students and teachers in their interaction.

The teacher-student interaction could be characterized as instrumental in 70% of all units of meaning. Exploratory interaction occurred in 17% of all units of meaning, although it has to be noted that most exploratory units of meaning were uttered by the students. The teacher allowed and facilitated exploratory interaction by allowing student's self-selection and topic shifts (cf. Nystrand & Gamoran, 1997). He initiated little exploratory interaction himself. Pedagogical interaction occurred in only 1%. Social interaction occurred occasionally, predominantly concerning the teacher's personal experience with Poles.

The teacher-student interactions showed a focus on the procedure and the product. The teacher often explicitly stated what students needed to do and how, what the final product should look like and what the consequences would be if the students failed to meet these requirements. Although the role of the teacher according to the project was a guiding one, the teacher tended to shift habitually to more monologically oriented interactional styles like recitation and initiation, response, feedback-sequences. Students followed the teachers lead. The result was that the teacher-student interaction often had the character of whole-class teaching in a small group setting. In addition, the vocabulary of the new situation, with words like 'ownership', was used in monologically oriented instruction. This resulted in many instances in which the 'new' and the traditional use of language conflicted.

Student interaction in general

The second question was 'Which functions of language can be observed in student interaction in collaborative learning and can this be related to the instruction students received?'. Student interaction was predominantly on-task with an average division of 70% on-task interaction versus 30% off-task interaction. In the two lessons that stood out regarding off-task interaction, circumstances were responsible for these high levels of off-task interaction. Students were quite conscientious in their interaction during project hours. When students did discuss personal matters, these discussions often entailed students' obligations to other school subjects. The three students I studied were on the whole rather conscientious in discussing on-task matters. The on-task frequencies where comparable to the frequencies I found in student interaction in seatwork.

The topics students discussed on-task in their interaction included the project setting itself, methodological aspects, the research subject and aspects of writing a

research paper. The topics that students discussed differed per lesson, depending on the phase of the project they were in. The specifics of the work-setting were discussed most often, with an average 28%. This varied from administrative remarks concerning what room would be most suitable to work in to more fundamental aspects concerning the rules and regulations that applied in the specific situation.

The teacher-student interaction was almost always on-task and showed the same focus on the situation: most units of meaning were about the work-setting. Despite the fact that both parties were working in this situation for the second year, it still was subject of discussion. Teacher and students appeared to find it difficult to determine what was expected of them and felt the need to discuss the situation often, both in the teacher-student interactions as in the student interactions.

Students' on-task interaction consisted mostly of instrumental units of meaning, with an average of 69%. Students used language predominantly as an instrument to carry out the project, which in this case entailed constructing their research paper. Students were focused on producing a proper paper by following the procedure as it was laid out by the teacher. The procedural mode occurred in 65% of all instrumental units of meaning, which means that 45% (69% of 65%) of all units of meaning was procedurally focused. In addition, most content-related units of meaning were uttered in relation to the product, answering the unasked question of how the information discussed could benefit the construction of the research paper or could be applied in the research paper. Student interaction was focused on 'doing', i.e. on completing the task.

The exploratory function of language occurred in 8% of all units of meaning. In some lessons, the exploratory function occurred more than in others. The exploratory function occurred most prominently when students discussed the phenomenon of Polish workers in the Netherlands. Exploratory episodes were, however, usually evaluated in terms of product, by determining in what way the discussed content could benefit the paper. Important to note was the fact that most occurrences of the exploratory function did not stand alone. Exploratory units of meaning usually received uptake by fellow students, making the exploratory episodes relatively extensive, especially as compared to the exploratory use of language in seatwork.

The pedagogical function of language occurred rarely, in only 1% of all units of meaning. Students did their best to design a research that would allow them to work individually in conducting the actual study. This undertaking could have made the students experts on a certain area, which could have facilitated the occurrence of the pedagogical function of language. This, however, was not the case. Students treated their individual subtasks as their own domains, which only touched the subtasks of others when the results of all subtasks were combined into one research report. And even then, pedagogical discussions seldom arose. Students were focused on the product in terms of 'doing'. This meant that students put their efforts in combining their individual work in such a way that the final report would meet the procedural demands the teacher had laid out. These were that the story had to 'flow' and that the complete text did not contain unnecessary repetitions. Since students perceived their research project predominantly as individual efforts eventually to be combined into a complete

paper, there was little need to understand each others' contributions, and therefore little need for pedagogical interaction.

The social function of language occurred when students discussed aspects of the project. 16% of all units of meaning could be characterized as social. The students' feelings concerning the nature of the teacher-student interaction, for instance, was discussed socially. Students described the teacher's way of interacting as 'talking so much', which made them feel that the teacher did not notice their own contributions.

The students' interaction and the interaction of the teacher showed similarities. A first similarity can be found in the frequency of occurrence of the functions of language in student interaction, which was similar to the frequency of the functions of language in teacher-student interaction. The instrumental function of language occurred by far the most often in over two-thirds of all on-task units of meaning in both types of interaction. The exploratory function of language occurred 14% and 17% of all units of meaning in student interaction and teacher-student interaction, respectively, and received uptake. The pedagogical function of language occurred rarely in both types of interaction. Only the social function of language occurred considerably more often in student interaction than in teacher-student interaction, probably due to the social relationship between the participants.

A second similarity can be found in the way language was used. Teacher-student interaction showed a focus on procedural matters. The teacher instructed the students on the characteristics of the product and on the way students should arrive at this product. The students showed the same procedural focus in their interaction. Students not only often interacted procedural-instrumental, content-related instrumental and exploratory remarks were also translated in terms of how they could benefit the product.

In addition to showing similarities in language use, the teachers' instruction was also often referred to in student interaction. Many student discussions entailed references to what the teacher had said in the coaching interactions and many instructional remarks the teacher had made were subject of discussion. The teacher's remarks were used to add weight to arguments the students made in their interaction, although other authorities were also referred to. In addition, students often referred to what the teacher had said to clarify what was expected of them, and what would be the consequences when they would fail to meet these expectations. In conclusion, the way the teacher interacted with his students was quite similar to the way students interacted with each other

Verbal construction of knowledge

The third question this study aimed to answer was: 'Do students verbally construct knowledge in collaborative learning and can this be related to the instruction they received?'. The verbal construction of knowledge was defined as the occurrence of both the pedagogical function and the exploratory function of language, and was furthermore searched for in the way students handled conflicting perspectives. In this

section I will first draw conclusions on the pedagogical and exploratory function of language. After that I will discuss the way students dealt with conflicting perspectives.

The pedagogical function of language only occurred when students guided others into knowledge concerning writing and methodology. This knowledge was mostly practical in nature and concerned knowledge about how to do something. In teacher-student interaction the pedagogical function occurred very little. This function of language appeared to be not a part of the teacher's repertoire. Student interaction also rarely showed the pedagogical function of language, even in situations in which it could have been appropriate. Students divided the work and combined their individual pieces into one complete paper. In this process, each student had to become an expert on his knowledge domain. The combining of the pieces did not result in pedagogical interaction, but mostly in instrumental and occasionally also exploratory interaction. Students were focused on product-related aspects. Explaining their perceptions to each other was not part of their repertoire, just as it was not part of the teacher's.

The exploratory function of language did not occur very often, especially in view of the aim of the situation. However, the function occurred considerably more often than in seatwork. In addition, the exploratory function of language received uptake by fellow students when an exploratory remark was initiated. Exploratory episodes were longer and more extensive than in seatwork. The exploratory function of language was treated as a valid way of interacting and usually received uptake. In all cases however, students translated exploratory contributions into action, i.e. into how these contributions could be added to the product students were working on, what actions should be undertaken in adding them and by whom these should be carried out. The focus on consequences for the product obstructed students' verbal construction of knowledge to a certain degree. Exploratory episodes ended when students felt they had constructed enough knowledge to attribute to their paper, even when from a conversational perspective the interaction was not yet finished, since there were still questions unanswered and opinions without argumentations.

When relating the students' exploratory interaction to the teacher's instruction, parallels can be drawn. The teacher focused his interaction on procedural aspects of collaborative working such as the specifics of a proper product, and often referred to product-related procedures such as how to arrive at a proper product and what the consequences would be when students would fail to meet these requirements. Although exploratory interaction was considered a valid way of interacting, the proper product received considerably more attention from the teacher in his instruction. The constant shift of students to the way the constructed knowledge would affect their paper could be considered a mirroring of the teacher's focus on the product.

Verbal construction of knowledge could possibly occur in situations of conflicting perspectives. However, situations in which a conflict arose did not result in verbal knowledge construction. Students treated these conflicting perspectives as procedures, as rules imposed on them by others. Conflicting perspectives were not settled by discussing which perspective was the most logical, the most functional or even the most convenient, they were settled by the status of the authority who had reflected that perspective. Students interpreted conflicting perspectives as conflicting procedures.

Following Bruffee's (1984, 1986) perception of learning as the entering of a discourse, student interaction in collaborative learning showed the entering of the discourse of the teacher and the community he reflected. The teacher's language use could be characterized as predominantly monological with ample instrumental interaction. As Nystrand (1997) argued, monologically organized instruction entails a static perception on knowledge. Knowledge in this type of instruction is presented as a given, consisting of unchangeable facts which have to be transmitted from teacher to student. The way students dealt with conflicting perspectives reflected the same perception of knowledge as the perception the teacher transmitted in his way of interacting.

The way the teacher constructed knowledge and the perception of knowledge he transmitted could be related to student interaction. The language functions the teachers used in the teacher-student interactions were taken over by the students. The pedagogical function of language was not part of the teacher's way of interacting and in turn seldom occurred in students' interaction. The exploratory function was attributed the status of a valid way of interacting, in view of the way the teacher facilitated its occurrence. The students subsequently dealt with exploratory remarks in the same way. The teacher's explicit focus on the product and accompanying procedures was however taken over as well, and occasionally hindered students' knowledge construction. The perception on knowledge the teacher's predominant monologic way of interacting transmitted, was incorporated by the students in situations in which conflicts arose. In these situations students actively reflected this perception on knowledge, resulting in procedural discussions.

Central question

The question that was central to this study, was: 'What aspects of teacher and task instruction influence students' language use in collaborative learning as compared to seatwork?' Since this particular form of small group work could be regarded as especially suited for students' co-constructing of knowledge, I expected to find more instances of verbal knowledge construction and a different way of dealing with situations in which conflicting perspectives arose than in student interaction in seatwork. To answer the central question, I start by discussing the differences between student interaction in collaborative learning and seatwork, after which I will relate these to the teacher and the task instruction on collaborative learning, ultimately answering the question that guided this study.

In discussing the differences between both types of student interactions I start with the division in on-task and off-task interaction. Off-task interaction occurred more often in student interaction in collaborative learning than in seatwork. This could be explained by two lessons in which students were working predominantly individually on the computer, seated next to students who where not part of their student group. On-task remarks were therefore hard to make. When leaving these two lessons out, the percentage of social interaction in collaborative learning was only slightly higher than in seatwork. In student interaction in collaborative learning, four different on-task topics could be distinguished, compared to only one in student interaction in seatwork. This

could be attributed to the more complex task students worked on in collaborative learning.

When focusing on the on-task interaction, the language functions that occurred in both types of small group work were similar. The instrumental function of language occurred most often in both types of interaction, with 64% in seatwork and 69% in collaborative learning. The occurrences of both the pedagogical function and the task related social function of language in student interaction were similar as well. The pedagogical function occurred in 1% of all units of meaning for both, while the social function occurred in 14% of all units of meaning in seatwork, versus 11% of all units of meaning in collaborative learning.

As expected, the exploratory function of language did indeed occur more often in collaborative learning than in student interaction in seatwork, with an average of 3% in seatwork versus 14% in collaborative learning. The difference was mostly due to the fact that exploratory utterances received uptake in collaborative learning. In seatwork, students often disregarded exploratory attempts and treated them as inappropriate behavior. In student interaction in collaborative learning, exploratory utterances were regarded contributions and were rarely disregarded by fellow students. The higher percentage of exploratory units of meaning was therefore for a large part due to higher uptake. Exploratory initiations were similar. Despite the fact that exploratory initiations received uptake, students' procedural focus resulted in interruptions of the exploratory episodes. Exploratory initiations were taken up, but did not often result in a complete discussion in which all questions were answered and in which the opinions of all participants were sought.

The way students dealt with conflicting perspectives was similar. In both situations, student interaction showed a focus on procedural aspects. In seatwork, students solved conflicts by referring to what students were expected to do. Conflicts of perspectives that arose usually concerned the teacher's and textbook's instruction and were solved by pointing out the proper procedure to each other. In student interaction in collaborative learning, conflicting perspectives usually involved a conflict between the different values or knowledge authority figures adhered to. These conflicts were solved by reducing these values and this knowledge into procedures concerning what to do and what was right according to these authority figures, if necessary determining which authority figure had the most status.

In view of the aims of the collaborative learning situation, it is remarkable that the student interaction in this situation was to a large degree similar to seatwork. This seems to contradict Nystrand and Gamoran (1997) who consider 'autonomous problem solving' to be a form of small group work especially suited for stimulating verbal knowledge construction between students. Both the task and the work-setting met the requirements set by Nystrand and Gamoran (1997), yet the nature of the student interaction did not differ much from seatwork. One factor, however, was more or less constant in both situations: the way the teacher interacted with his students. Teachers used predominantly the procedural-instrumental function of language in monologically oriented interaction (Nystrand, 1997b). Teachers predominantly took on the role of instructor and focused on similar things in their instructions. In both situations teachers'

interaction was not focused on subject content, but on work related aspects. Teachers either focused on the way students had to work or on what their work had to deliver.

It appeared that neither the task nor the work-setting had a decisive influence on how students interacted. The teacher and the way the teacher interacted with his students however, appeared to have this decisive influence. Student interaction showed the same occurrence of functions of language as the teacher instruction did, as well as the same use of these functions. The way students interacted with each other resembled the way the teacher interacted with them. The students showed the same focus on procedural matters and adhered to the same perception of knowledge. Student interaction showed many instances in which the instruction of the teacher was discussed or referred to. The teacher instruction appeared to play an important role in student interaction. The finding of the previous study, that students appeared to mirror the verbal interaction of the teacher, also applied in this case. Students talked the way the teacher talked, and in doing so, they constructed the values that the teachers had indicated to be important.

The teacher guided his students in their work on the project and could be considered a representative of a community of discourse. The teacher's guidance had the character of an instruction. The question arises what community of discourse the teacher represented. It seemed the teacher only represented the general school discourse, not a school subject discourse. The teacher reflected the values of this discourse by using recitation and instruction. These are both monological types of interaction (cf. Nystrand & Gamoran, 1997), which require little thinking or active participation of the students. The values the teacher reflected concerned aspects on what perspective of knowledge should be adhered to (knowledge as a given), and how to be a good student (doing as the teacher told them). The teacher enforced these values by referring to the inevitable negative consequences if they would disregard his comments.

As Vygotsky (1978) argued, learning cannot be separated from its social context, since learning is the process by which learners are integrated into a culture. The teacher is an important part of the social context. In terms of Bruffee (1984), the teacher could be regarded as the primary representative of the discourse community that students entered during project hours, and was therefore the students' guide into that discourse community. Learning to speak the language of the discourse community appeared to entail learning to speak as the teachers spoke.

The central question of this study was: 'What aspects of teacher and task instruction influence students' language use in collaborative learning as compared to seatwork?'. It appeared that the students' language use in collaborative learning did not differ all that much from seatwork, and neither did the instruction of the teacher. The written task and the work-setting appeared to influence student interaction to a limited extent, primarily concerning the topics students discussed.

However, some aspects of teacher instruction could be distinguished that appeared to influence student interaction. The first way in which teacher instruction appeared to influence student interaction concerned the content of the units of meaning the teacher uttered. Students often referred to his exact words. Students appeared to

follow the instruction meticulously, and put a lot of emphasis on contributions of the teacher.

The second way in which the language use of the teacher appeared to influence student interaction became clear in the similarity between teacher and students' language use. Instrumental interaction occurred most often in the procedural mode. Student interaction showed the same frequency of occurrence, and the same focus on procedural aspects. The way the teacher dealt with exploratory interaction was reflected in the way students dealt with exploratory utterances.

The third way in which the language use of the teacher appeared to influence student interaction, concerned the values of the community of discourse the teacher reflected. The monologically oriented instruction reflected a transmission perspective on knowledge and learning. This resulted in a procedural focus which obstructed students' verbal construction of knowledge. It resulted furthermore in students interpreting conflicting perspectives as conflicting procedures and solving them by referring to authorities.

Nystrand and Gamoran (1997) argue that teachers shape groupwork by assigning tasks and establishing parameters of interaction. However, it appeared that the teacher in this study did not only establish parameters for the interaction, he also shaped the way students interacted and constructed knowledge. In Section 6.7.2 the conclusions drawn in this section will be further discussed, in addition to the strengths and limitations of this study. Finally, suggestions for further study will be made.

6.7.2 Discussion

Design of the task

The design of the task does not seem to be as important to the nature of student interaction as the nature of the teacher's interaction. This seems to contradict Nystrand and Gamoran's (1997) argument that complex tasks providing students with a large degree of autonomy in how and what to work on are a necessary condition for the co-construction of knowledge. As discussed, the task in collaborative learning did meet the requirements of 'autonomous problem solving' (Nystrand & Gamoran, 1997). The 'task', or the research project the students were to construct, was complex and demanded a more complex answer than one just right or wrong. Students needed to discuss and argue and students did receive a relatively large degree of autonomy.

However, the level of autonomy that was instated by the task appeared to be reduced in the teacher-student interaction. Students felt they were not heard in these interactions and felt that their contributions were not valid. In addition, the teacher told his student explicitly what to do and how to work, which according to Nystrand (1997) diminishes student autonomy and according to Chiu (2004), Dekker and Elshout-Mohr (2004) and Gillies (2004) has a detrimental effect on the quality of student interaction. Autonomy as a necessary factor for the verbal construction of knowledge was therefore not met. This was not because the task did not contain this element, but because teacher-student interaction diminished the students' sense of autonomy.

A second factor appeared to influence how the task was carried out. Although the task was designed as a form of 'autonomous problem solving', students themselves interpreted the task differently, from the very start of the project. Students explored a topic, formulated a research question and created three sub-questions which they divided amongst themselves. Students designed these questions as right-wrong questions, which could be answered individually and to which only one answer could be considered correct. In this respect students efforts were similar to the efforts students showed in seatwork: answering a question. Students closed the open task, by working and interacting in the same way students did in seatwork. Although in theory the task could lead to verbal knowledge construction, in practice both parties interpreted the task as closed. They confirmed and even emphasized this interpretation in interaction with each other.

As this study showed, when compared to the results of student interaction in seatwork, the design of the task did indeed have some influence on the nature of student interaction. The task in the collaborative learning situation was more complex and therefore led to more complex interaction, especially concerning conversational topics. The nature of the task, however, appeared not a sufficient factor to ensure the occurrence of verbal construction of knowledge.

The factor that did appear to be of influence on whether students actually construct knowledge in their verbal interaction was the way the teacher interacted with them. Students themselves interpreted the task as closed, and the teacher's monologically oriented instruction confirmed and emphasized this. Students appeared to not only need a stimulating environment to verbally construct knowledge, they also appeared to need stimulating teacher interaction. This finding is in line with Webb *et al*. (2009, p. 51), who hypothesized "that what matters in terms of teacher interventions with small groups is not whether teachers provide help that focuses on the subject matter content of group work versus guidance about what collaborative processes groups should carry out, or whether teachers should provide more-explicit versus less-explicit content help. Rather, what may be important is whether teachers try to ascertain student thinking and base their interaction with the group on what they learn about students' thinking on the task."

An explanation for this phenomenon can be found in the metaphor that characterizes learning as entering a discourse, or as learning to speak the language of people who are already member of a certain community of discourse. When a student interacts with others he practises the language he thinks he is required to speak. When determining the specifics of this language, or the systems of values and knowledge, he perceives the way the teacher interacts as leading. When a teacher interacts monologically, transmitting the value that knowledge is a given which cannot be altered, students perceive this way of interacting as the way they should interact. In the collaborative learning case, they perceived it in addition as a confirmation of the way they were already speaking. Students did not so much do *what* the teacher said, they did *as* the teacher said. Students' choice of words, the functions of language that occurred in their interaction, and their way of prioritizing certain values could be linked to the nature of the teacher's interaction. The question is whether students were

entering a discourse or just appeared to be already embedded in the discourse of school.

A consequence of this finding is that merely changing a task or a work-setting appears to be not enough when intending to change students' way of interacting. Although the task and the work-setting in the project I studied were designed for optimal student autonomy, and thus for facilitating students verbally constructing knowledge, students still interacted the way the teacher interacted. It appeared that in stimulating or facilitating the verbal construction of knowledge, both the nature of the task and the work-setting were not as influential as the interaction of the teacher. Even in a situation in which all elements were present to ensure student autonomy, the teacher could 'spoil things' by the way he instructed his students. Nystrand and Gamoran's (1997) argument concerning the importance of the design of the task may only hold up when dialogically oriented teacher instruction as a necessary condition is met.

Teacher instruction

A question that rises when considering the findings of this study is the question why the teacher interaction was predominantly monologic in teacher-student interactions. The collaborative learning situation was aimed at a new way of learning, in which both the students and the teacher would assume different roles as compared to traditional education. However, in view of the way both interacted, these different roles were not so assumed. Teachers and students both interacted using the traditional discourse, instead of a new discourse belonging to the role of a coach and to the role of students who take responsibility for their own learning. The main explanation may be found in the power of a familiar discourse, rooted in a long history. Students and teachers have been taking part in the traditional discourse of the school for many years. This discourse does not change so easily.

Three results of my study point towards this explanation. The first may be found in the specifics of the situation students and teachers found themselves in. Although the collaborative learning situation was not new, both teacher and students appeared to experience uncertainty as to what was expected of them. Both students and teacher often interacted about the requirements of the collaborative learning situation, both in general and in relation to the research project students worked on. Teachers discussed amongst each other what the responsibilities of their roles were, when being teachmaster or workmaster, and moreover, why these roles were designed the way they were, because in practice teachers experienced many difficulties with them. The focus in these discussions appeared not to be on how to shape these responsibilities, but on the more procedural question of what teachers were to do and why things could not change. The answer one of the teachers gave was however rather procedural as well: 'It just has to be this way', which seems to indicate that the new discourse teachers were supposed to guide their students in, was not to all respects the discourse teachers themselves were a part of.

The collaborative learning situation appeared to be a situation that needed a new discourse, a new system of knowledge and values concerning working in the classroom and a new way of interacting. The participants strove after this new discourse by using the old discourse, resulting in a situation in which teacher and student were both in a way aspiring members, who did not succeed in creating this new community of discourse. The systems of values and knowledge that were created in interaction were at best a mixture of old and new. Conflicts between values arose easily. However, instead of perceiving these conflicts as instances for constructing knowledge, students and teachers perceived them as instances to establish the proper procedure, which fitted within the familiar discourse.

The second result concerned the aims teachers pursued. Teachers not only needed to guide students in their work on their project, they also needed to ensure that students produced a proper paper. In general, teachers have only limited time to transmit a relatively large amount of knowledge. Elich, Rehbein and Ten Thije (1993) described the dilemma teachers face in certain pedagogies. On the one hand a teacher wants his students to discover new knowledge by themselves, whereas on the other hand he wants them to do it right, to produce something that adheres to his standard. In the collaborative learning project, this confronted the teacher with a considerable pedagogical dilemma. On the one hand, he needed to guide his students based on their own lead, but on the other hand, if the teacher did not help to delimit, the students would get stuck, and when the students would fail to deliver a proper product he was obliged to give a negative evaluation. Being confronted with the dilemma to let students go or take them by the hand, the teacher made the safe choice and told his students what to do.

The third result concerned the language use of the students. Students translated the open task to closed questions, introducing the old discourse at the very start of the project. In addition, they contributed to the predominant monologic interaction of the teacher by following the teacher's lead in the teacher-student interactions, for instance by participating in recitation. This could be regarded an involuntary process. Teachers and students both appeared to slip automatically into familiar discourse patterns, which confirmed the way they interacted as the proper discourse, resulting in a self-sustaining process.

An interesting observation was made in Section 6.5. Even in situations in which the teacher did not interact monologically but constructed his instruction in a dialogue with his students, students interpreted the outcome of the teacher-student interaction as something that was imposed on them. In retrospect they perceived dialogically oriented interaction as monological. Perhaps this was due to the otherwise predominant monologic teacher interaction. By interacting monologically, the teacher constructed a dominant way of interacting, which was assimilated by the students. Changes in the monologic teacher interaction were possibly overlooked, because students still interpreted them from a monologic perspective.

The students' acceptance, incorporation and reflecting of the language use the teacher transmitted in his instruction, affirmed and perhaps even emphasized the teachers monologic way of interacting. Since the students focused rigorously on procedural aspects, it is possible that the teacher felt even more obliged to instruct his

students instead of guiding them. Since students appeared not to have a firm grasp on the way they delimited their research project and did not show proper ownership, the teacher could be even more tempted to solve the pedagogical dilemma he faced, by instructing the students in the proper way to work. In a way, the traditional way of language use appears to be a self-sustaining way of interacting. Even in situations in which a new discourse is needed, both teacher and students fall back on more traditional discourse, for which they both indeed have valid reasons as this section showed.

Considerations to this study

This chapter presented a study into the nature of student interaction in collaborative learning in relation to the language use of the teacher. The study provided a detailed analysis of the way both parties used language and constructed systems of values and knowledge in the process. An important limitation of this study is the fact that my data consists of the interactions of three students and two teachers during one research project. Therefore, the results of this study have to be interpreted as a representation of the processes that could play a role in student and teacher-student interaction, rather than as generalizable facts on teacher-student interaction.

This study resulted in an indication of the processes that could influence student interaction. Student interaction appeared to be closely related to the teacher interaction, which could be explained by the theory that represents learning as entering a discourse. Students appeared to perceive the teacher's language use as the proper way to interact. They incorporated and discussed the content of the teachers contributions, but moreover, they incorporated and actively reflected the values the teacher transmitted, by mirroring the use of language functions of the teacher in frequency and focus.

If the language use of the teacher in his instruction does indeed influence student interaction to quite a degree, it would be interesting to see whether a change in the teacher's language use could establish a change in student interaction. As this study showed, the nature of the task appeared to be, at the most, a necessary but not sufficient condition for the occurrence of the verbal construction of knowledge. The nature of a teacher instruction on the other hand appeared to have a decisive influence on how students interact and on whether they construct knowledge in their verbal interaction. Chapter 7 therefore presents the results of an experiment with teacher instruction. In a small scale experiment I tested whether a more exploratory instruction in seatwork could lead to more exploratory student interaction.

CHAPTER 7

An experiment with student interaction in seatwork

7.1 Introduction

In the previous studies a relation was observed between teacher-student interaction and students' subsequent interaction in autonomous working was. Students not only interacted with each other in the way their teacher interacted with them, they even corrected themselves and each other when they deviated from the example the teacher had set and explicitly adhered to the values of the teacher in situations in which a conflicting perspective arose.

The interactions of both teacher and student appeared to be predominantly instrumental. The instrumental function of language often occurred in the procedural mode, i.e. in discussing the proper way to do something, or in establishing the consequences for the final product. The focus on the procedure it in many cases obstructed the discussion of the subject content. The exploratory function of language played a limited role in student interactions in both studied situations. The pedagogical function of language, which is the other function of language with which knowledge is verbally constructed, occurred even less frequent than the exploratory function. Language was mostly used monologically oriented, not dialogically (cf. Nystrand, 1997b).

The way the teacher interacted, however, appeared to be rather influential on the way students interacted when working on their own. Both the nature of the task and the work-setting seemed to be less influential on the nature of student interaction. Considering these findings, I wondered whether a different teacher instruction could result in more verbal construction of knowledge in student interaction, even when this interaction took place during textbook task based seatwork. In the study this chapter reports on, I attempted to change the teacher instruction to seatwork, in order to shift students' verbal interaction from predominantly instrumental to more exploratory.

Of course this is a rather bold attempt. The emergence of a certain way of interacting within a community of discourse, is not simply an action-reaction affair, but is something that grows, with every utterance containing knowledge and values building upon the knowledge and values of previous utterances. Teachers and students as a community have interacted predominantly monologically for many decades. The way

they interact is therefore to a large part based on their experiences, as a group and as individuals, with what is proper classroom interaction. Students' mirroring of interacting the way the teacher interacted therefore does not have to be the direct consequence of the preceding instructions. However, since students placed a lot of value on the precise instruction of their teacher and often referred to the exact words the teacher used, the nature of the preceding instruction does play a role in student interaction. It is therefore feasible that a more exploratory instruction could lead to more exploratory student interaction.

This chapter presents the results of an experiment conducted based on these ideas. The chapter starts with an overview of the research design of the study in Section 7.2. In Section 7.3 the selected cases are discussed and the results of the experiment are presented. In Section 7.4 the conclusion and discussion are presented, and the implications of the results are discussed.

7.2 Research design

7.2.1 Research question

The previous two studies indicated that there was a relation between teacher instruction and the nature of the subsequent student interaction when working independently from the teacher. The question is what would happen if the teacher instruction would contain more content-related instrumental and exploratory units of meaning. This study therefore aimed at changing the teacher instruction, to see if and how this would influence student interaction in seatwork. If student interaction could indeed be influenced by changing a teacher's verbal and written instruction, it might be a relatively straightforward way to improve the revenues of this much practiced teaching method.

It is rather difficult and time consuming to change a person's verbal behavior, since apart from a change of actions, this also requires a change of the beliefs underlying the behavior (Richardson, 1996). With the available time and means an experiment aimed at such a drastic change of teachers' beliefs could not be conducted. In this study I therefore decided to consider the teacher instruction to be solely a means to changing students' verbal behavior. I chose a pragmatic approach for my experiment, focusing on merely changing of the teacher's behavior instead of a changing his beliefs. The teacher did not need to *be* different, just to *act* different. The main research question that guided this experiment was:

> Does changing the teacher instruction to one containing more content-related and exploratory functions of language, result in student interaction with more content-related and exploratory functions of language when working independently on textbook tasks?

With the concept 'teacher instruction' was meant the verbal instruction of the teacher to the textbook tasks the students would be working on during a seatwork period. Seatwork was defined as a certain period in class in which students were to work independently from the teacher. This period contained the teacher instruction and the subsequent student interaction until either the lesson ended or the teacher announced that time was up.

The change in teacher instruction was operationalized as an increase in language use associated with the verbal construction of knowledge. Since the pedagogical function of language rarely occurred in student interaction, I initially focused on an increase of the occurrence of the exploratory function of language and content-related interaction, both as defined in the analytical framework. The concept 'textbook tasks' implied all tasks students worked on, and which were derived from the textbook used in that lesson. The concept of 'student interaction', finally, was defined as all units of meaning students uttered in seatwork.

7.2.2 Design of the study

In order to answer the research question, I abandoned the naturalistic approach that characterized this research project so far. To discover whether the nature of the teacher instruction could indeed change the way students interacted in seatwork, I designed a small-scale experiment. I aimed at changing the verbal teacher instruction from procedural-instrumental, to more content oriented combined with a more exploratory way of instructing. I decided to design and implement the specific changes in cooperation with the teachers in order to be able to adjust the change to the personal way of interacting of the teacher and to be able to adhere to the specific school subject content. In addition, by designing the changes in cooperation with the teachers, I aimed at making them partly 'owner' of the change, in order to motivate teachers to instruct the students in the way we designed. My previous studies resulted in a list of the characteristics that verbal instructions contained - see for an extensive list of such characteristics Bolhuis and Voeten (2001). A teacher instruction appeared to contain at least some of the following characteristics:

- Procedural elements
  - Stating the task
    Reference to the tasks that have to be done or reading the task and the location where the written task instructions can be found out loud – "Work on assignment 6 to 19 on page 23 of the textbook"
  - Temporal limitations
    The time students are granted to work on the task – "You have 10 minutes to perform these tasks"
  - Procedural limitations
  - The way a task has to be performed to be considered correct – "Write the answers in a table"
  - Procedural aim

Discussion of what action students should be able to perform after completing the task, in which knowledge and understanding remain implicit – "When you've finished the task, I want you to explain the rules of 'few' and 'little' to me"

- Content-related elements
  - Indication of the level of difficulty of the task
    "This is a difficult task" or "This could be an exam question"
  - Content description
    Description of the content of a task, in addition to stating the task or reading it out loud – "The task deals with a balance sheet, which contains the notions income and expenditure"

In my experiment, a number of changes were proposed to these verbal instructions in consultation with the teachers. The changes were aimed at stimulating content-related language use and the occurrence of more exploratory functions of language. These changes were derived from the results of my previous study and were based on the finding that the content of teacher instruction, the language functions that occurred in teacher instruction and the values the teacher transmitted in his instruction, influenced the nature of student interaction. My previous studies had indicated that students were driven to do as the teacher told and mirrored the verbal behavior of the teacher, not only in the way they interacted, but also in the way they solved conflicts and verbally constructed knowledge. I therefore proposed a change in the instruction from procedurally focused to focused on school subject content and learning. I furthermore proposed to add more content-related and exploratory language use, resulting in the following proposed elements to add to teacher instruction:

- Procedural elements:
  - Exploratory function of language
    Since following the proper procedure was an important element of discussion in student interaction in autonomous working, the exploratory function of language was presented as part of the proper procedure of seatwork by explicitly stating speech acts teachers wanted their students to use, like 'reasoning' and 'discovering', for instance: "You have to reason in dyads on what the difference is between costs and payments. Reason." (teacher writes the word on the blackboard)
  - Learning aim
    In addition to the exploratory function of language also the learning aim was presented (cf. Bolhuis & Voeten, 2001), first to make the learning aim part of the proper procedure, second to shift students' focus from 'doing' to 'learning': "I want you to learn what the difference is. At the end of the lesson you have to understand how this works."
- Content-related:
  - Content-related explanation
    The task was not only procedurally explained, but also content-related. The meaning of the used concepts was explained instead of mentioned: "We call this

a probability tree, because it is a tree diagram that represents probabilities. If you look at a branch, you see that the chance of AA is ½ times ½. If there is a branch after a branch, you multiply."

- Content-related to learning aim
  This aim focused on either school subject specific conceptual knowledge or understanding, or school subject specific procedural knowledge or understanding. "After completing the task, you will know what the labor market in the 18th century looked like, and why it was constructed this way."
- Exemplary behavior
  In addition to the above mentioned adjustments, teachers themselves also used the verbal behavior they expected from their students. They used the exploratory function of language to discuss the school subject concepts in illustrative reasoning, providing students with an example to model their behavior: "Perhaps the landlord will say: 'I want you to pay the rent at the start of December.' So in 2009 you'll pay the rent for 2010 in advance. That's 1300 euro. The consequence is a difference between costs, being 1200 euro, and payments, being 1300 euro in a year. […] That difference is the difference task 68 deals with. […] So reason about these differences, just like I just did in this introduction."

To ensure that the task would not hinder students' exploratory interaction, in cooperation with the teacher, tasks were selected that contained questions with answers that were either right of wrong, yet required a form of reasoning and contained terminology like 'why' and 'discover'. To stay close to the regular lessons, the written tasks were selected from the textbook. The tasks chosen were ones like "Why was the concept of 'trias politica' important to Enlightenment philosophers?". In the beta subjects, tasks were chosen that demanded calculations or another form of reasoning, like "What happens with the stock when the purchases are smaller than the value of the turnover?".

7.2.3 Participants

Just like the previous two studies, this study focused on students of sixteen to seventeen years of age, following a pre-university or a pre-university of applied sciences education in the penultimate year. I selected a school in the south of the Netherlands I worked with for the first study, which offered all levels of secondary education. My previous connections with this school facilitated first contact and facilitated obtaining permission to record teachers and students. The school in question was a public school without any specific educational philosophy.

The teachers were first and foremost selected on the basis of the school subject they taught. To facilitate a comparison between this study and the previous two, I again opted for different school subjects: a language class, a science class and a class from the social sciences domain like History, Geography or Economics. Secondly, the teachers were selected based on their interest in a different form of instruction. The experiment demanded close cooperation with the teacher. Willingness of the teacher to adjust his

way of verbal interaction was therefore a necessary criterion. Ultimately four teachers were selected for the experiment: a teacher of Dutch (as mother tongue), a teacher of Economics, a teacher of History and a teacher of Mathematics.

In order to study the consequences of the adapted teacher instruction on the verbal interaction of students in seatwork, two lessons were studied: a regular lesson in which nothing was changed, and an experimental lesson in which the teacher instruction was adjusted. The regular lessons were chosen in consultation with the teachers. There were two requirements these lessons had to fulfill: they had to contain periods of seatwork during which students were allowed to interact, and the teacher had to provide both a written and a verbal task instruction. There were no requirements set on the duration of the seatwork period, nor on the content of the lesson, in order to influence the natural situation as little as possible. The experimental lessons were also chosen in negotiation with the teacher. No requirements were formulated as to the duration and the content of the lesson. The requirements formulated on the verbal instructions to the task are discussed in detail in Section 7.2.2. Students were selected at random at the start of the study. I attempted to record the same students during both the regular and the experimental lesson; however, due to eventualities, this was not possible in all cases. In the History lesson one dyad differed in the regular lesson and the experimental lesson.

7.2.4 Conducting the study

The complete study was conducted in two phases. In the first phase teacher and student interaction in seatwork was studied in regular lessons. These studies were used as a point of reference for the second phase, when a study was conducted on teacher and student interaction in seatwork in experimental lessons.

In the first phase, to ensure that the lesson would indeed be regular, neither teachers nor students were told about the precise aim and underlying assumptions of the study prior to the observations. The teachers were asked to participate in a study on seatwork which would demand an active contribution on their part. They were not informed on the precise nature of the contribution so this would not influence the way teachers instructed their students. Students were told the study was about seatwork without further specifying the notion, so knowing the precise aim of the study would not influence the way they interacted. Three to four recordings of three student dyads were made in the regular lessons for every school subject. I chose to do several recordings in the regular lessons to leave room for eventualities.

In the second phase, the teachers were informed of the precise nature of the study and they were asked to actively implement the changes proposed in Section 7.2.2 in their own task instructions. During two sessions with each individual teacher, starting with an interview on their views on task instruction, the teacher and I discussed how the changes could be implemented in the teacher instruction with regard to the teacher's way of interacting and to the content of the school subject, with a special focus on the exploratory reasoning the teacher would have to use himself. In addition, we selected tasks from the textbook the teacher used that met the requirements

presented in Section 7.2.2. After these sessions, the teachers were asked to carry out the experiment in the same classes as the regular lessons.

I observed three to four experimental lessons per school subject, again, to be able to meet eventualities, but also to allow the teacher to get used to this changed form of instruction. After every lesson the teacher and I evaluated the changed instructions and I asked for adjustments in the verbal instruction if necessary.

Both the regular and the experimental lesson were observed as unobtrusively as possible. The verbal interaction of all participants was recorded from the start to the end of the lesson, so the placement of the recording devices would not disturb or distract the participants during class. Small voice recorders were placed on the desks of the students. The voice recorder of the teacher was placed under his shirt, thus invisible to the students. I myself was seated as an observer in the back of the classroom, so my presence was not directly visible to the students and would therefore cause minimal disturbance.

The participating teachers were interviewed on their way of instructing students and their views on education at the start of the experimental part and after the experiment. In addition, all other conversations with the teachers concerning the experiment were recorded. Students were interviewed twice, once after the recordings of the regular lessons and once after an experimental lesson. They were questioned on their way of working during these lessons and on their perception of the teacher instruction. These interviews were used as an aid in the transcription of the recorded seatwork interaction and in the interpretation of student interaction. Finally all written task instructions were collected.

7.2.5 Data selection

This study aimed at discovering whether a more exploratory instruction subsequently would lead to more exploratory student interaction. Of course, only lessons in which the teacher instruction had actually changed could lead to a satisfying answer. I conducted this experiment in a total of four cases: History, Economics, Mathematics and Dutch. In three cases however, the experiment did not have the intended result. In History and Dutch the teacher instruction changed minimally. In Mathematics the teacher instruction did change, however not to a more exploratory use of language, but towards a more pedagogical use of language. Only in Economics the verbal instruction of the teacher changed to a more exploratory use of language.

To find out more about the relationship between teacher instruction and the subsequent student interaction, I selected three cases for further analysis, based on their rate of success. I chose one case in which the experiment succeeded, being Economics, one case in which the verbal instruction was changed, however not quite as intended, being Mathematics, and one case in which the experiment did not succeed, being History.

For the analysis, I decided on two lessons per case: one regular lesson as a point of reference and one lesson in which the experiment was conducted. Each lesson embodied a corpus of data that contained recordings of the verbal teacher instruction, a copy of the written task instruction and recordings of the interaction between three

student dyads in seatwork, in addition to the recorded interviews of both teachers and students and the recorded discussions on the implementation of the changes. I selected only the best lessons of every case for analysis. Lessons selected as best regular lessons were lessons in which most of the recorded students were present, matching with the experimental lesson. The selection of the best experimental lessons was based on the verbal instruction of the teacher. Only the lessons in which the teacher instruction met the requirements set in Section 7.2.2, or met these requirements as best as possible were selected for further analysis.

The design proposed resulted in the following dataset. The numbers mentioned represent the number of each data type per case.

Table 7.1: Overview data

	Data types	Mathematics	Economics	History	Total
Regular lesson	Recordings of verbal instruction	1	1	1	3
	Copy of written instructions	1	1	1	3
	Recordings of students interaction	3	3	3	9
Experimental lesson	Recordings of verbal instruction	1	1	1	3
	Copy of written instructions	1	1	1	3
	Recordings of students interaction	3	3	3	9
Interviews	Interviews with teacher	4	2	2	8
	Interviews with students	2	2	2	6

7.2.6 Data analysis

The verbal interaction of both teacher and students during the seatwork lesson were transcribed and divided into units of meaning and episodes (cf. Section 3.5). I analyzed these units using the analytical framework I constructed. Since student interaction in seatwork is of a different nature than student interaction in collaborative learning, I used the analytical framework as constructed in Chapter 4. The division in actions concerning the content-related and the procedural function of language did not contribute to answering the central question in this study, so I left this out of the analysis. The analytical framework as used can be found in the appendix.

As the first study (cf. Chapter 5) showed, students tended to discuss social matters when they were finished with the task before time was up. These social episodes proved to be unavoidable since students who are finished have nothing on-task left to interact about. These episodes do in no way contribute to answering my central question. In this study I have therefore excluded them from analysis.

The units of meaning that were characterized in terms of functions of language were analyzed on frequency of occurrence, using Excel's count-if formula's. In addition, episodes in which the verbal construction of knowledge played a role were qualitatively analyzed in combination with the analytical framework as discussed in Chapter 3. These were flagged by the occurrence of conflicting perceptions concerning subject content, procedures and values, and by the occurrence of the exploratory or the pedagogical function of language. The meaning students made was reconstructed by using the additional data to interpret and re-interpret students' units of meaning. Both the regular lessons and the experimental lessons were analyzed this way. After the analysis the results of both the frequency analysis and the qualitative analysis of the experimental lesson were compared to those of the regular lesson in order to answer the central question.

7.3 Results

7.3.1 Case description

As mentioned in the previous section, three out of four cases were selected for analysis. Despite the efforts of the teachers and myself, it proved to be quite difficult to change the teacher instruction. In the following section I will describe the three cases I chose for my analysis, i.e. Economics, Mathematics and History.

Economics

In the case of Economics, the teacher already paid attention in his verbal instruction to the content of the task students had to work on. In addition, the teacher already incidentally used the exploratory function of language in his verbal interaction with the students, even in the regular lesson, before the start of the experiment.

The teacher perceived seatwork tasks in general as means for his students to understand the workings of Economics. He considered the correct procedure of the task as less important than the students' understanding. In one of the interviews the teacher referred to a case in which all students had forgotten to do part of the task: "In fact another year was mentioned in the task, but they forgot to read that, and in that case I thought: well, we'll just skip that part. I think it is more important that they talk about the task, it doesn't have to be perfect. […] When they are tested, they are presented with completely different cases. I think they should be able to analyze these lessons, to decide what information they need, and that differs per case. I don't want to lose time on details that are only part of one particular case." (Interview Economics teacher, 07-04-09). The teacher advocated interaction between students and not only allowed but

also stimulated them to interact. He perceived student interaction in seatwork as relaxing for the students and he believed a relaxed environment would provide better working circumstances.

The Economics lesson selected to represent the regular lesson, was one lesson in which students had to discover what financial elements a pay slip contained. Students had to work on a task in which they had to correctly enter several concepts into a tree diagram that represented the different salary deductions in the Dutch tax system. The diagram had already been drawn and the concepts were already given. The reasoning part existed of perceiving the correct relations between the different concepts.

The lesson selected to represent the changed instruction was the first experimental lesson. In this lesson the teacher instructed his students to discover the principles of interest in credit loans and to work on a task in which this principle was paramount. Students worked on a case in which an entrepreneur borrowed a certain amount of money, which he had to pay back. The case in the task consisted of calculation exercises and several what if-scenario's, which appealed to the students reasoning skills.

History

In the case of History, the teacher regularly prescribed tasks derived from the textbook for seatwork, but also created his own tasks. The seatwork tasks the teacher created were predominantly based on the textbook content, aimed at dividing work load and sharing knowledge between students, like summarizing sections or finding main elements in sections. The other tasks the teacher created took more time to complete than the duration of one lesson and demanded a form of creativity of the students. In performing these tasks students brewed medieval beer or cooked up ancient meals. These latter tasks the teacher designed based on his perception of the importance of images in learning in general and History in particular. As he argued: "Students remember historical facts better when they can imagine it, than when they only learn dry facts" (Interview History teacher, 02-04-09). In line with this philosophy he also often showed film materials in his classes 'to bring history alive' as he argued. The teacher varied his seatwork using different teaching methods based on group size. Sometimes he let his students work in dyads, other times he arranged groups of three to five students.

The instruction in the regular lesson could be considered predominantly procedural. The teacher's method to get students to think, as well as work in seatwork, was to emphasize in his instruction that they should work together and to let students explain the subject to each other. Despite this latter point, students interacted rarely with each other in seatwork. Interestingly, the group of students in the History case consisted of the same students as in the Economics case, when the students did interact.

The case that represented the regular lesson was a lesson on the Industrial Revolution in Great Britain. Students had to complete eight tasks from the textbook, seated in dyads. These tasks contained questions that referred to sources like pictures and historical texts. The questions all demanded a form of reasoning. For instance

'Source 6 shows one of the first steam engines of England. This one was built near a coal mine. Why were the first steam engines built next to coal mines?'

The case that was selected to represent the experimental instruction was the second experimental lesson. In this lesson, the teacher instructed his students to work on a book section which contained tasks on every section of the chapter on colonialism. The teacher divided the tasks per student dyad, so that every dyad worked on two tasks, with the intention that at the end of the seatwork every dyad could explain in front of the class to the other students the content of the tasks it had made.

Mathematics

In the case of Mathematics, the instruction of the teacher in the regular situation could be considered predominantly instrumental. The students in his class worked using a study guide which told them what tasks they had to complete within a certain lesson. Neighboring students did not always work at the same pace. Students did interact and asked questions, but not always worked together on the same task.

The Mathematics teacher already had some ideas on how he wanted his students to interact in autonomous working. He regarded interaction in seatwork as a way for students to find an answer to questions they might have concerning the task they worked on. His ideal of student interaction would be students helping each other the way he helped them, i.e. by asking questions instead of answering them. The teacher indicated that his way of interacting differed per lesson depending on the content. However, every student question he treated the same way: "I try to guide them to the answer by questioning the student, so they get the idea 'oh, that's how it works'. Sometimes students ask questions, but through my questions they solve them themselves and then I say: 'So what did you do? *You* solved this problem.' That builds their confidence." (Interview Mathematics teacher, 03-04-09).

The teacher's way of interacting could be characterized as pedagogically oriented, in the definition as used in this study. The Mathematics teacher had expressed the wish to focus his instruction on the pedagogical function of language instead of the exploratory function. Since this function of language was also associated with the verbal construction of knowledge, albeit in a different social relation, this experiment would still be able to provide an answer to the question whether the verbal construction of knowledge in student interaction in seatwork could be stimulated by changing the teacher instruction. I therefore decided that this alteration in the original research design was justified.

The case that was selected to represent the regular lesson was a lesson in which students had to work on a so-called diagnostic test concerning square roots and exponential growth. This diagnostic test was a separate section with mathematical problems at the end of each chapter in the textbook. The answers to these problems could be found at the back of the book. The aim of the test was for students to test their knowledge on the subject.

The case that was selected to represent the experimental instruction was the first experimental lesson. In this lesson the teacher instructed his students as to how they could interact with each other when encountering difficulties and he explained the first

steps of statistics. Students subsequently worked on the first mathematical problems of the chapter concerning statistics.

Comparison between the cases

Table 7.2 shows the time in minutes of each seatwork period and the number of units of meaning of the teacher and the students. To be able to compare the number of units of meaning of the students, these are expressed in relation to the minutes available resulting in an average of units of meaning per minute per lesson. As Table 7.2 shows, there is some difference in the average number of units of meaning per lesson. The regular history lessons stood out with an average of only 2.3 units of meaning per minute. In the experimental situation however students interacted a lot more, with an average of 7 units of meaning per minute. The units of meaning in the other cases were similar in the regular and the experimental lesson. Apparently the experiment in these cases had no effect on how many units of meaning were uttered in seatwork.

Table 7.2: Duration of seatwork periods and numbers of units of meaning

		Seatwork time in minutes	Number of teacher units of meaning	Total sum of student units of meaning	Average number of student units of meaning per minute
Economics	Regular	11	47	139	12.6
	Experimental	21	90	270	12.9
History	Regular	14	12	32	2.3
	Experimental	21	25	146	7.0
Mathematics	Regular	27	50	246	9.1
	Experimental	19	196	186	9.8

7.3.2 Case 1: Economics

Instruction regular lesson

In the regular lesson the verbal instruction of the teacher already contained some exploratory units of meaning and a focus on the content of the task. The teacher not only introduced the task the students had to work on, but also explained the content of the task, which concerned possible salary deductions in the Netherlands, like social security. In addition to procedurally coordinating action, the teacher stimulated his students to interact on the matter of pay costs and social security in working on the task, as Transcript 7.1 illustrates.

T: And what I want you to do is talk in pairs and discuss how social security is built up. Who pays what regarding social security and what kind of social security do we have? And discover what our pay slip is composed of, because in the end we pay for this social security ourselves.

Transcript 7.1: Teacher instruction in Economics, regular lesson

The teacher not only stimulated his students to interact, but also added illustrative questions that students could ask themselves and each other in interaction ("who pays what" and "what kind of") and an instruction concerning exploratory interaction ("discover what a pay slip is composed of"). The nature of the student interaction that followed after this instruction was in some respects similar to the teacher instruction however not concerning the division of on-task and off-task interaction. Table 7.3 shows this division. N represents the total number of units of meaning.

Table 7.3: Percentages of units of meaning on-task and off-task in Economics, regular lesson

Economics	Teacher N=47	Student N=417
On-task	94	49
Off-task	6	51

In the regular lesson the teacher instruction was predominantly on-task. The 6% off-task interaction consisted of a conversational pleasantry ('good morning by the way') the teacher uttered when instructing the students. The student interaction that followed after this instruction showed a different division: 49% of the units of meaning were on-task, the other half was off task. When observing the differences between the student dyads, the difference is even more notable.

Table 7.4: Percentages of units of meaning on-task and off-task, including individual student dyads in Economics, regular lesson

Economics	Teacher N=47	Student N=417	Dyad 1 N=113	Dyad 2 N=160	Dyad 3 N=144
On-task	94	49	33	30	83
Off-task	6	51	67	70	17

The third dyad was considerably less off-task than the other two dyads. I will address this phenomenon later in this section. When we for the moment disregard this difference in on-task and off-task behavior, and focus solely on the on-task behavior, some tendencies become visible in the occurrence of the functions of language, as Table 7.5 shows.

Table 7.5: Percentages of functions of language in Economics, regular lesson

Economics	Teacher N=44	Student N=210	Dyad 1 N=37	Dyad 2 N=48	Dyad 3 N=125
Exploratory	9	8	11	–	10
Pedagogical	–	1	8	–	–
Instrumental	91	86	68	100	86
Social	–	5	14	–	4

The units of meaning both teacher and students uttered could predominantly be characterized as the instrumental function of language. Respectively 9% and 8% of the units of meaning could be characterized as reflecting mainly the exploratory function of language in both the teacher instruction and in the student's verbal interaction. Only 1% of the units of meaning in student interaction could be characterized as pedagogical, against none in the teacher instruction and 5% could be characterized as social, again against none in the teacher instruction.

Table 7.6 shows the instrumental modes in which both teacher and students used language. Both teacher and students tended towards discussing the content of the task in their interaction.

7.6: Percentages of the procedural and content-related mode of the instrumental function of language in Economics, regular lesson

Economics	Teacher N=40	Students N=177	Dyad 1 N=27	Dyad 2 N=48	Dyad 3 N=102
Procedural mode	45	34	44	33	31
Content-related mode	55	66	56	67	69

Despite the fact that the difference in on-task and off-task interaction differed a great deal between dyad 3 and the other two dyads, the on-task interaction showed the same general tendencies of occurrences of functions of language and modes. Students interacted predominantly instrumental, the social, exploratory and pedagogical function occurred considerably less. The same was true for the teacher instruction. The content-related mode occurred most often, in both teacher instruction and in student interaction.

Verbal construction of knowledge

The focus of both the teacher instruction and the student interaction was more on the content than on the procedure of the task, as the previous section indicated. Analysis of episodes in which conflicts occurred showed that content-related problems were still solved predominantly procedurally. Transcript 7.2 shows an episode in which dyad 3 encountered a conflict between their answer and the composition of the task.

B: What else is deducted from the gross income?
L: Nothing else
B: Yes there is
L: But there is no room left for anything else

Transcript 7.2: Dyad 3 – Bert and Lisa in Economics, regular lesson

Transcript 7.2 started with Bert's question concerning what else was deducted from the gross income, after which Lisa answered that there was nothing else. Bert's second unit of meaning indicated that he believed that indeed there was something more to be deducted. The transcript ended with a procedural argument on a content-related question. The procedural argument Lisa made ("No room left") was rooted in the task the students were working on. They had to fill out a tree diagram that had already been drawn – the places that had to be filled in were fixed and left no room for another deduction item, so no discussion concerning possible other items was needed, as Lisa pointed out.

In fact, the task left even less room for discussion than both students thought. Only at the end of the seatwork period, student dyad 3 discovered that the words they had to fill in in the tree diagram were already summed up in the written task instruction above the diagram. Transcript 7.3 illustrates this.

L: (reads out loud) Pay costs is net income plus income tax.
Maybe it is income tax?
B: Gross income… this is deducted, the net income
L: If this is deducted, then this is your net income
B: Yes… Oh wait, you just have to pick them from above!
L: What the fuck!
B: She already has it!
L: (laughs) Oh, let's see! Then this is the employers part and this is the insurance premium.
B: Yes, this is the premium
L: Yes, you write it down.
B: So this was all!

Transcript 7.3: Dyad 3 – Bert and Lisa in Economics, regular lesson

Coincidentally Bert and Lisa were also the only dyad that was predominantly on-task, instead of predominantly addressing social topics like the other two dyads. Their misinterpretation of the nature of the task leads them towards a mainly content-related discussion on gross and net income. Their discovery that the task was not as complex as they thought even resulted in a rather disillusioned remark: 'so this was all'.

In this regular Economics lesson the nature of the task seemed to hinder student interaction. In the on-task student interaction of all three dyads, students focused on the content of the task rather than the procedure. However, only in the student interaction of the dyad that misinterpreted the aim of the task an elaborate discussion on the school subject arose instead of a discussion on predominantly social topics. Although in theory the task demanded a form of reasoning, since students had to show

understanding of the relationship between the concepts by fitting them in a proper position, in practice students primarily followed the procedure, by merely placing the concepts by looking for clues in the textbook. The deductions on the gross income were discussed in the textbook, right above the task, so students could already fill in three concepts, leaving only four. Since the concepts were already provided, students could place them in the diagram without needing to understand in which position. Only dyad 3 could not treat the task as an exercise in logic, because they did not have the concepts that needed to be fitted in the diagram at their disposal, actually discussed the content of the task.

Experimental lesson

Since the teacher instruction already included some features that my experiment aimed to implement, it was relatively easy to change the instruction in cooperation with the teacher. A textbook task was selected which demanded calculation and reasoning skills from the student, to ensure that the nature of the task would not hinder student interaction in seatwork. Both alterations had interesting results.

The teacher's verbal instruction showed changes on several levels, as Transcript 7.4 illustrates.

T: So I want you to work in dyads on task 68. The nasty thing about that, is when someone in 2009 says, well what do I pay on rent, you can say its about 100 euro a month, so my costs are 1200 euro for rent in a year. As you know, an entrepreneur says at the end of the year, well, how did I do? Did I do good? Did I do bad? What is my turnover? And then I deduct my stock from my turnover. And if I've done that I deduct my costs and then I arrive at my net profit. Right? This is all repetition.
S: Hey, but I thought net profit was interest without tax?
T: Hold your horses, take a step back. Let's take it slow. What I sold, what I received from my costumers in my registry, what did buying stock cost me and what kind of costs do I have. Rent for instance. So an entrepreneur would say: I take 1200 euro and I put them up as costs. That reduces my net profit and thus my profit tax. Those are costs. You see Ivan?

Transcript 7.4: Teacher instruction in Economics, experimental lesson

The teacher started with procedural-instrumental units of meaning, stating what he wanted his students to work on. The instruction continued with a content description of what the task was about, containing not only content-related instrumental units of meaning, but also exploratory reasoning on the subject. The teacher verbally illustrated the reasoning an entrepreneur might follow concerning his costs, thus explaining the concepts 'net profit' and 'costs' and showing how they correspond to the concept of 'tax'.

After this content-related introduction of the concepts the students needed to understand when working on the task, the teacher continued with a statement of what

he wanted his students to learn in combination with an exploratory encouragement, as Transcript 7.5 illustrates.

T: So, that is what task 68 is about. So what I want you to learn is the difference between costs and payments. That difference is what I want you to learn. And I want you to reason with each other on what this difference entails, just as I did in the introduction. So reason in dyads about costs and payments and maybe you'll discover how these two concepts relate to each other. At the end of the lesson I want you to understand how this works and I want you to understand the task you worked on. Go ahead.

Transcript 7.5: Teacher instruction in Economics, experimental lesson

All in all, the teacher's verbal task instruction showed a number of differences in the experimental lesson as compared to the regular lesson. First and foremost, the teacher's instruction took up almost twice the number of units of meaning as compared to the regular lesson (cf. Table 7.2). The average number of units of meaning per minute in the subsequent student interaction was comparable with 12.9 versus 12.6. The instruction contained more content-related units of meaning, more units of meaning could be characterized as reflecting the exploratory function of language and the exploratory function of language was made into an explicit part of the correct procedure of working on the task.

Table 7.7: Percentages of units of meaning on-task and off-task in Economics, experimental and regular lesson

Economics	Experimental lesson		Regular lesson	
	Teacher N=90	Students N=881	Teacher N=47	Students N=417
On-task	86	69	94	49
Off-task	14	31	6	51

Table 7.7 shows the frequency of the on-task and off-task interaction in the experimental and the regular lesson. The on-task interaction in the experimental lesson was considerably higher than in the regular lesson. Social topics received less attention from the students in the experimental lesson compared to the regular lesson. The percentage of 31% is comparable to the percentage found in the previous two studies as discussed in Chapters 5 and 6.

Table 7.8 shows the percentages of the functions of language uttered by both teacher and students in the on-task interaction.

Table 7.8: Percentages of functions of language in Economics, experimental and regular lesson

Economics	Experimental lesson		Regular lesson	
	Teacher N=77	Students N=557	Teacher N=44	Students N=210
Exploratory	31	14	9	8
Pedagogical	–	10	–	1
Instrumental	69	74	91	83
Social	–	2	–	8

As Table 7.8 shows, the attempt to change the teacher instruction to focus more on the content and contain more exploratory interaction worked out rather well. The teacher's units of meaning concerning the task in the experimental lesson could be characterized as more exploratory (31% versus 9%) and less instrumental (69% versus 91%) than in the regular lesson. The subsequent student interaction also showed some differences concerning the occurrence of the functions of language. The student interaction could be characterized as more exploratory with 14% compared to 8% and surprisingly, more pedagogical with 10% versus 1%. The interaction was slightly less instrumental and less social.

Table 7.9 shows the percentages of modes in which the instrumental function of language was used. The percentage of the modes in the regular lesson in teacher instruction was 45% procedural and 55% content-related. The subsequent student interaction was 23% procedural and 77% content-related. The teacher instruction in the experimental lesson showed the same modes as the experimental lesson. The student interaction however was considerably more focused on the content of the task.

Table 7.9: Percentages of procedural and content-related instrumental function of language in Economics, experimental and regular lesson

Economics	Experimental lesson		Regular lesson	
	Teacher N=53	Students N=420	Teacher N=40	Students N=177
Procedural	45	23	45	34
Content-related	55	77	55	66

Verbal construction of knowledge

Both the exploratory function of language and the pedagogical function of language occurred more often in student interaction in the experimental lesson. Exploratory units of meaning did occur more often. However, they did not receive more uptake than in the regular situation. Most exploratory utterances in which an inference was made, a hypothesis was constructed or some line of reasoning was followed, were still single remarks. Pedagogical initiations also occurred more often, however they did not receive more uptake either. Transcript 7.6 illustrates both.

R: Do you get it?
M: Yes, hold on, I'll explain
(8.0)
M: Eh, seven is long term strange capacity
R: Yes, I had that one
M: And with eight, you have to take that 100,000 and take six percent of that for the interest
R: So you'll do times zero point six
M: Yes, I always divide by one hundred times six, that's how I do it
R: And what if you do it times zero, you do times zero point ninety four right?
M: I don't know, I am used to doing it this way, and that's why I do it this way
R: Oh well, and what is it then?
M: 6,000 and you divide it by twelve, is five hundred euro interest per month
R: 6,000 divided by twelve
M: Yes, is five hundred interest per month

Transcript 7.6: Dyad 2 – Maria and Ruth in Economics, experimental lesson

In Transcript 7.6 Ruth starts with a pedagogical asking for help concerning the task, phrased: "Do you get it?". Maria promises to explain when she is finished writing down her calculations. She starts her explanation with providing the answer to question 7; Ruth however had already arrived at that answer. Then Maria explains how to work out question 8. She does however not refer to the question why the procedure she proposes will result in the proper answer. The pedagogical initiative the episode started out with, turned into Nelson-Le Gall's (1992) executive help giving instead of the more pedagogical oriented instrumental help giving. The exploratory question that followed, in which Ruth constructed a line of reasoning concerning the calculation of percentages "And what if you do it times zero?" did receive uptake, however again not pedagogical or exploratory. Maria answered Ruth's exploratory remark with a procedural answer: she did not know the answer, she was used to calculating percentages one way so that's why she did it. Ruth did not address the issue any further and focused on the answer to the task.

The experimental situation did show an increase in the occurrence of both the exploratory function and the pedagogical function. This increase, however, still consisted mostly of single remarks without uptake, or uptake that did not result in the verbal construction of knowledge. Ruth's pedagogical question concerning the way to calculate percentages could have resulted in the construction of a new way of calculation for Maria. With her procedural rejection of Ruth's exploratory utterance, the possibility for verbal construction of knowledge however was done away with.

7.3.3 Case 2: History

Regular lesson

The instruction in the regular lesson of the History case differed from the one in the Economics case. The language use in the regular teacher instruction in Economics could be characterized as predominantly content-related. In the regular lesson of the History

case the teacher instruction could be characterized as brief and predominantly procedural-instrumental, focusing on what students needed to do during the seatwork lesson and how the tasks were to be carried out. Transcript 7.7 shows the entire verbal instruction in the regular History lesson:

T: I want you to work on the exercises, they process the subject content rather well, I think. If you do these exercises, you'll get an idea on what this section deals with. We'll work on learning route one: one, three, six, seven, ten and twelve. I myself will deal with four and five, if we get to that. The rest of the exercises you will work on now. In pairs or so, for all I care in threes, but don't work on it alone, it is easier in pairs. It is now 11.40, at 11.55 I will check on the problems. Okay?

Transcript 7.7: Teacher instruction in History, regular lesson

The instruction to do seatwork primarily dealt with the tasks in a procedural manner. The teacher did mention the general aim of the tasks ('They process the subject content rather well' and 'You'll get an idea on what this section deals with'), however, he did not relate this to the specific subject content. The teacher specified the tasks the students had to work on and urged his students to work together, accompanied by an argument based on the work process: "It is easier in pairs".

Student interaction that followed this seatwork instruction was as brief as the instruction. Students interacted very little with each other, with an average of 2.3 units of meaning per minute. Compared to the units of meaning per minute in the regular Economics and Mathematics lesson (cf. Table 7.2, respectively 12.6 and 9.1), this is quite a small number. Student interaction in the History lesson showed many moments of complete classroom silence.

In interviews, the teacher indicated that he did not to know why students interacted so little. On the one hand, he did not seem to perceive the lack of student interaction as a necessarily bad thing. He said that he perceived a quiet classroom to be an orderly classroom. On the other hand, in the lessons I observed, the teacher did not appear to do or say anything to prevent his students from interacting. On the contrary, in most lessons he expected his students to work in groups. The students indeed sat in groups, but interacted little, just like the regular lesson I studied.

Table 7.10 shows the on-task and off-task interaction in both the teacher instruction and in the students' subsequent verbal interaction in seatwork.

Table 7.10: Percentages of units of meaning on-task and off-task, including individual student dyads in History, regular lesson

History	Teacher N=12	Students N=96	Dyad 1 N=11	Dyad 2 N=32	Dyad 3 N=53
On-task	100	95	82	94	98
Off-task	–	5	18	6	2

As Table 7.10 shows, the teacher instruction was exclusively on-task, as was most of the subsequent student interaction. Students used little social interaction compared to student interaction in other lessons, cf. Chapter 5. The students not only interacted very little, the interaction the students did conduct dealt almost exclusively with the task.

The units of meaning in teacher instruction could be characterized as fully instrumental. The units of meaning in student interaction could be characterized as 95% instrumental and 5% exploratory. Both the social function and the pedagogical function did not occur, as Table 7.11 shows.

Table 7.11: Percentages of functions of language in History, regular lesson

History	Teacher N=12	Students N=93	Dyad 1 N=9	Dyad 2 N=32	Dyad 3 N=52
Exploratory	–	5	–	–	10
Pedagogical	–	–	–	–	–
Instrumental	100	95	100	100	90
Social	–	–	–	–	–

Since the total number of units of meaning was so low, it is important to understand what these percentages mean. The percentage of exploratory units of meaning of dyad three was formed by one student who made a total of two exploratory remarks in four units of meaning. In Transcript 7.8 one of these exploratory episodes is described in detail. All other on-task units of meaning in student interaction could be characterized as instrumental. Finally, Table 7.12 shows the percentages of the modes in which instrumental function of language occurred.

7.12: Percentages of procedural and content-related instrumental function of language in History, regular lesson

History	Teacher N=12	Students N=93	Dyad 1 N=9	Dyad 2 N=32	Dyad 3 N=52
Procedural	100	49	89	63	35
Content-related	–	51	11	37	65

The teacher only used the procedural mode. Students on the other hand used both the procedural and the content-related mode. In the student interaction of dyad 1 and 2 the procedural function occurred predominantly, since students' single remarks to each other only concerned what exactly students should do. In the interaction of dyad 3 an actual conversation arose, which focused on the content of the task and consisted mostly of the checking of answers and the superficial discussion of historical concepts like the meaning of the word 'waterframe'.

Verbal construction of knowledge

The occurrence of the student interaction during the regular History lesson could be characterized as rare and predominantly procedural in two of the three dyads. The interaction between the students was choppy in nature. Most episodes only consisted of two or three units of meaning and between the episodes long periods of silence occurred. The episodes could mostly be characterized as question-answer sequences, either concerning what students should do, or containing a check of the answer the other student had come up with. Student dyad 3 showed the most units of meaning, a total of 52. The dyad also interacted mostly on-task and predominantly content-related.

The interaction of this dyad was also the only interaction in which the exploratory function of language occurred. Transcript 7.8 shows one of the two episodes. May presented a line of reasoning on the consequences of a failing machine in a plant at the time of the Industrial Revolution. May started the episode by answering a question from the book, which read: 'What would happen when the machine failed?'

M: When the machine failed, there was no production, and then they didn't earn any money. I think.
C: I think?
M: (Laughs) I don't know
(two minute silence)

Transcript 7.8: Dyad 3 – May and Celia in History, regular lesson

May presented a line of reasoning on what would happen when the machine would fail. She inferred that a failing machine would lead to a stop in production and subsequently in a halt of earnings. She followed her line of reasoning by her hesitation on the correctness of this exploratory remark by stating 'I think'. Celia only take up on May's hesitation, after which May laughed at her own remark and stated her ignorance. After this remark the episode ended.

Exploratory utterances were treated as inappropriate behavior. Celia only took up on May's hesitation, not on her reasoning, implicitly correcting May for inappropriate behavior. May accepted this implicit correction by laughing and declaring her ignorance, thereby downplaying her intellectual contribution. In the second occurrence of the exploratory function of language something comparable happened, but in this case Celia completely ignored May's remark. Exploratory interaction was explicitly not the norm in student interaction during History. Students rarely interacted and when they did, they interacted choppily in short question-answer sequences. May's attempts at a more fluid conversation by expressing a line of reasoning were corrected and ignored.

Experimental lesson

In the experimental lesson, an attempt was made to change the instruction so that it used more content-related and exploratory units of meaning. However, other than with the Economics case, the change in the teacher instruction in the History case was not

very successful. The teacher instruction in the experimental lesson could still be characterized as predominantly procedural-instrumental. The content of the tasks was not addressed at all. In contrast with the regular lesson, the verbal instruction did contain however one exploratory unit of meaning, as illustrated in Transcript 7.9. The teacher verbalized his reasoning on why he wanted his students to discuss the tasks they made in seatwork in front of the class.

T: Alright. In a minute, you will be trying to do two tasks. I want you to discuss these tasks for the rest of the group. The idea is that when you have to explain something, you understand it properly.

Transcript 7.9: Teacher instruction in History, experimental lesson

In view of the students' very scant interaction in seatwork, the teacher tried to oblige the students to interact, by demanding a public presentation of the students on their findings after the seatwork period. Although the content of the instruction changed minimally, the number of units of meaning the teacher uttered more than doubled. The number of units of meaning in student interaction even tripled, as Table 7.13 shows. As Table 7.2 showed, the average number of units of meaning in student interaction in the experimental lesson was 7.0, a big difference with the 2.3 in the regular lesson.

Table 7.13: Percentages of on-task and off-task interaction in History, experimental and regular lesson

History	Experimental lesson		Regular lesson	
	Teacher N=25	Students N=293	Teacher N=12	Students N=96
On-task	100	84	100	95
Off-task	–	16	–	5

Table 7.13 shows the on-task and off-task interaction by both teachers and students in both the regular and the experimental lesson. Student interaction in the experimental lesson showed 11% more off-task interaction than in the regular lesson. In the experimental lesson, students not only interacted more, but also chatted more. The average number of units of meaning in student interaction was still rather low compared to other lessons (which were around 9 and 12), but did not differ as noticeably anymore.

Table 7.14 shows the percentages of the functions of language that occurred in the on-task interaction in both the experimental and the regular situation. The teacher instruction showed a little more exploratory interaction. The subsequent student interaction showed a little more exploratory interaction, and 9% of social interaction. Students in the experimental lesson not only chatted more, but displayed a greater variety of functions of language overall, although the variety was still not very large compared to student interaction in other lessons.

Table 7.14: Percentage of used functions of language in History, experimental and regular lesson

History	Experimental lesson		Regular lesson	
	Teacher N=25	Students N=213	Teacher N=12	Students N=93
Exploratory	4	8	–	5
Pedagogical	–	–	–	–
Instrumental	96	84	100	95
Social	–	9	–	–

The instrumental function occurred by far the most, in both the regular and the experimental lesson. When looking at the modes in which this function was used, it appeared that in the experimental lesson students used the procedural mode even more often than during the regular lesson. Students regularly procedurally discussed where exactly an answer could be found in the textbook. The question of what exactly to write down was a common end to every episode. Table 7.15 shows the occurrences of both the procedural and the content-related instrumental function of language. In the teacher instruction, the instrumental function only occurred in the procedural mode.

7.15: Percentages of procedural and content-related instrumental function of language in History, experimental and regular lesson

History	Experimental lesson		Regular lesson	
	Teacher N=24	Students N=203	Teacher N=12	Students N=93
Procedural	100	59	100	51
Content-related	–	41	–	49

Verbal construction of knowledge

The student interaction in the experimental History lesson showed no occurrences of conflicting perspectives. In that respect there were no instances in which students could have constructed knowledge. The exploratory function of language did occur, with 8%. The absolute number of units of meaning in student interaction in the experimental lesson was still rather low, and 8% exploratory interaction meant that only 17 of the 293 units of meaning could be characterized as such. The exploratory function of language was used by two out of three dyads, in one episode each. The function was used to answer the task and received uptake in only one of these episodes. Transcript 7.10 shows this episode. Celia and May discussed what the most important belief of Enlightenment philosophers was.

C: Eh, let's see… The three forms of power needed to be executed by three different institutions.

M: Executed. People were not subordinated to someone else anymore, or something like that
C: Yes, something like that. That was what Enlightenment was all about, right, not being subordinate anymore?
M: Well, this is one of these guys or something like that, he thought people didn't need institutions like that. He believed 'humanity had strayed from its original simple way of living. A person is born free, but exists in chains everywhere'. That had to end, he thought. Or something like that.
C: He went even further
M: Yes
C: Hey, but eh now not just one person could have power over everybody, or something like that, right?
M: Yes, also the king was subordinate to this. The people were sovereign, which means that there was no higher power above that. He taught so-ve-reign-ty of the people.
C: Then we will do: 'because of this the people were sovereign too'. We'll just do this entire sentence.
M: Yes

Transcript 7.10: Dyad 3 – May and Celia in History, experimental lesson

Celia started this episode by proposing an answer to the question both students saw written down in the textbook. May took up on Celia's formulation of the answer by adding that people were not subordinate anymore. Celia agreed. Celia furthermore took up on May's addition by inferring that what May had said was exactly the core of the Enlightenment era: not being subordinate anymore. May found one of the Enlightenment philosophers in the textbook and articulated his point of view, partly reading out loud from the textbook. Celia concluded from May's contribution that this philosopher went even further than most Enlightenment philosophers. May agreed.

Celia took up on all previous contributions by hypothesizing that because of these ideas not one person could have power over everybody else. May agreed and took up by adding that even the king was subordinate to this. May furthermore added the notion 'sovereign', reading out loud what the book stated as definition. She rephrased the definition of the book, by using the term in her own sentence, carefully pronouncing the new word 'sovereignty'. Celia concluded by translating the discussion into a proper answer, which she derived from the textbook: "Because of this the people were sovereign too". She explicitly stated they were going to use the whole sentence from the textbook as an answer to the question. May agreed.

In this episode students showed exploratory interaction with many uptakes. In contrast to the regular lesson, in this episode exploratory utterances were not disregarded, but taken up by the fellow student. Notable however is the frequent use of the phrase "Or something like that". This phrase appeared to be more of a slang utterance expressing intellectual modesty than true hesitation on the answer. The sentence seems to be a way for students to excuse themselves for interacting exploratory, for reasoning or hypothesizing. Adding "Or something like that" seems to be used to downplay the intellectual level of a previous utterance into something more

acceptable to students. This seems to indicate that exploratory interaction is still perceived as out of the ordinary behavior, as language use that is not entirely appropriate for student interaction in seatwork.

The formulation of the final answer students decided on, was not derived from students exploratory discussion. The students chose to answer the task with a complete sentence derived from the textbook. The knowledge students constructed themselves was this way not validated as a proper answer to the task. This last notion played a pronounced role in student interaction during the History lesson. Only sentences from the textbook were regarded proper answers. Most instrumental episodes dealt with tasks in the same way. Students did not formulate an answer, they searched for a fitting sentence in the textbook.

7.3.4 Case 3: Mathematics

Regular lesson

In the regular lesson in the Mathematics case, the verbal instruction of the teacher could be characterized as instrumental. The teacher stated which tasks the students had to have completed up until now, and stated what tasks they should work on next, in a procedural-instrumental instruction, as Transcript 7.11 illustrates.

T: You have finished the tasks until task 74, if everything is correct. So now you start on the diagnostic test. If everything is not correct, you make sure you get to task 74 as soon as possible, because in the lesson of Wednesday 5th the test on this chapter takes place. And this test is not easy, I'll admit immediately. So have a good seatwork lesson and go for it!

Transcript 7.11: Teacher instruction in Mathematics, regular lesson

The rest of the teacher's utterances in the instruction were of a social nature. He congratulated a boy with his birthday, and expressed his values on how students should behave in class, by commenting on bathroom breaks and the absence of working material. Table 7.16 shows that 78% of the teacher instruction was on-task and 22% off-task. The student interaction that followed the teacher instruction was almost evenly divided between on-task interaction and off-task interaction. Compared to other lessons, in which the frequency of on-task interaction was usually higher than the frequency of off-task interaction with an average of 66% versus 33%, off-task interaction occurred quite frequently in this lesson. The specification per dyad shows that the differences between the three student interactions were small.

Table 7.16: Percentages of units of meaning on-task and off-task in Mathematics, regular lesson

Mathematics	Teacher N=50	Students N=739	Dyad 1 N=198	Dyad 2 N=229	Dyad 3 N=312
On-task	78	49	59	41	50
Off-task	22	51	41	59	50

Table 7.17 shows the percentages of the function of language both teacher and students used in the regular lesson. The teacher's interaction was solely instrumental. Student interaction was predominantly instrumental with 66%, the other functions of language also occurred: 14% pedagogical, 15% social and 5% exploratory.

Table 7.17: Percentages of functions of language in Mathematics, the regular lesson

Mathematics	Teacher N=39	Students N=367	Dyad 1 N=116	Dyad 2 N=95	Dyad 3 N=156
Exploratory	–	5	16	–	–
Pedagogical	–	14	26	–	13
Instrumental	100	66	49	64	81
Social	–	15	9	36	6

As the specification of the interaction of the student dyads showed, there was some difference between the student interactions. The instrumental function of language was dominant in all interactions. The other functions of language differed in occurrence. The exploratory function of language only occurred in the interaction of dyad 1, which also showed a high occurrence of the pedagogical function of language. The pedagogical function also occurred in dyad 3, with 13%. In dyad 2 neither function that is related to the verbal construction of knowledge occurred.

When looking more closely at the nature of the interaction of dyad 2, which also showed the most off-task interaction, it appeared that both students were quite distracted by a personal problem of some magnitude. The students mostly discussed this personal problem and only intermittently worked on a task, verbally focusing on the formulation of answers. In addition, they stimulated and motivated themselves by stating that despite everything, they worked rather well. This is shown from the frequent occurrence of the social function of language.

Table 7.18 shows the modes in which the instrumental function of language was used. Although the teacher never used the content-related mode, students did. About 57% of the units of meaning could be characterized as content-related. However, this average percentage was composed by three more or less similar percentages. Dyad two however showed more procedural interaction than the other two dyads, which could be explained by the social problem that influenced the nature of the interaction.

Table 7.18: Percentages of the procedural and content-related function of language in Mathematics, regular lesson

Mathematics	Teacher N=39	Students N=244	Dyad 1 N=57	Dyad 2 N=61	Dyad 3 N=126
Procedural	100	43	42	59	35
Content-related	–	57	58	41	65

Table 7.18 shows no frequency relation between the modes of teacher instruction and the subsequent student interaction.

Verbal construction of knowledge

Student interaction in the regular Mathematics lesson showed quite some variation between the dyads. However, one thing sprang to attention: the relatively frequent occurrence of the pedagogical function of language. In student interaction in general, the pedagogical function rarely seemed to occur. The fact that in two separate student interactions this function occurred more often than in all other lessons studied in this research project deserves further study. Transcript 7.12 illustrates the occurrence of the pedagogical function of language. The transcript starts when Jane sighes that she didn't succeed in drawing the figure that corresponded to the mathematical exercise.

J: Oh, why can't I draw this?
D: Let's see.
J: Look here, the answer is a negative number, but they say that that is no solution
D: That's because this one is odd, so than you can get that kind of figure. Just like this one. Look, this one is even, but this one is odd, so you get a figure like that. So it can be drawn. I probably did it wrong too. But I think you have to look at even and odd too
J: Oh yes of course

Transcript 7.12: Dyad 1 – Doris and Jane in Mathematics, regular lesson

After Jane's expression of frustration, Doris took up on it as if it were a pedagogical request for guidance with 'Let's see'. Jane subsequently explained her problem with the exercise: She arrived at a negative number, but 'they', a nameless authority, probably the textbook or the answer booklet, had proclaimed that that was not a proper solution. In Doris' subsequent reaction she explained what the problem was, being the fact that whether the number was odd or even was also relevant to drawing the figure. At the end of her explanation Doris added an interesting remark 'I probably did it wrong too' with which she weakened the knowledge hierarchy between the students that this pedagogical episode possibly caused. Doris might have known why Jane encountered difficulties, but Jane should not think that this made Doris an expert on the subject or more knowledgeable than Jane. Jane ended the episode by accepting Doris' explanation.

This transcript illustrates that the pedagogical function during Mathematics generally occurred in a rather informal way. Students rarely explicitly asked for guidance, but expressed their difficulty with something, after which the neighboring student tried to help. The natural way in which the pedagogical function of language occurred in addition to its rather abundant occurrence, seemed to indicate that pedagogical interaction was rather common practice in student interaction during Mathematics. However, it seemed that in this transcript the pedagogical function of

language created a sense of hierarchy Doris felt she needed to weaken to maintain a good relationship with her peer.

Experimental lesson

The teacher focused on the pedagogical function of language instead of the exploratory. The experiment was conducted using the same list of requirements (cf. Section 7.2.2) as in the previous two experiments. However, the notion 'exploratory' was replaced by 'pedagogical'.

The change of the teacher instruction was successful in showing more pedagogical interaction and more content-related units of meaning. In the first part of his verbal instruction the teacher explained how he wanted his students to interact with each other in seatwork, i.e. how he wanted his students to guide each other, why he wanted the students to guide each other and what would be the learning revenues of interacting in the way he proposed. The teacher furthermore referred to his own way of helping students as an illustration of what he meant. The first part of the teacher instruction is represented in Transcript 7.13.

T: Have you noticed how I explain things to you?
K: Yes, you make us find out on our own, instead of giving the answer. You never give the answer.
T: How do I make you find out on your own?
G: By asking questions
T: By asking questions. Well, in a minute, you will work on the questions regarding chapter 6. When you do that I want you to ask a classmate for help when you experience difficulties. I will be grading your work, so I don't have any time for you. You'll have to find out on your own. So, you'll ask your neighbor how things work. And your neighbor cannot say: oh it's like this, because you do not learn anything from that. You learn by discovering yourself.

Transcript 7.13: Teacher instruction in Mathematics, experimental lesson

Transcript 7.13 started with a pedagogical question to introduce the topic the teacher wanted to discuss, referring to his own way of explaining as an illustration. The nature of the second teacher question was more or less recitative instead of pedagogic. However, the teacher continued with explaining how he wanted his students to interact in seatwork. The entire episode was about twice the size of this transcript and also contained a number of reasons why this way of interacting would be beneficial to the students. Although the teacher predominantly used the instrumental function of language to instruct the students on this new way of interacting, in the second episode in the teacher's instruction, which concerns the specific mathematical topic of that lesson, the teacher used the pedagogical function of language quite often. Transcript 7.14 represents a part of this episode. The teacher explained a way to calculate probabilities in dialogic interaction with the students. He only explained a way that

would facilitate the calculations somewhat, since the simplest way was quite a lot of work.

T: So this makes three branches again, A, B and C
K: It is still a nuisance
T: It is, isn't it? But still, it is an improvement to that one, is it not?
K: But I was thinking more along the line of, you have two times the possibility to draw A
T: Yes, so what are the probabilities that I draw an A on the first wheel?
K: Half
T: Indeed, two four, or in other words half. What are the probabilities that you draw a B?
K: Yes, that is again…
S: No, its not, because you have only one B
T: No, because you have only one B on the wheel
K: Yes, no no no, I mean to draw an A again. That is half right?
T: Oh, you mean over here, half? Three out of six is half
K: Yes, and if you multiply that you instantly get one fourth
T: And if I draw this one, the probabilities are also one fourth. This one is two sixths is one third and C is one sixth, I believe. And this counts everywhere: half, one third, one sixth, half, one third, one sixth. And this is what we call a tree diagram of probabilities.

Transcript 7.14: Teacher instruction in Mathematics, experimental lesson

Transcript 7.14 started in the middle of the episode when the teacher concluded that his first strategy of making calculations on probabilities is slightly less time consuming. Kent objected to this conclusion by stating that this new method was still a nuisance. The teacher agreed, but emphasized that this new method was still an improvement on the old method. Kent, however, was thinking of a different way, which he tried to put in to words. He did not finish his line of thought. The teacher took up on his suggestion by asking a recitative question: "So what are the probabilities that I draw an A on the first wheel?" and after Kent answered this question, the teacher again asked a recitative question. Kent started to answer the question but was interrupted by Sylvia who disagreed and explained that there was only one B, which the teacher repeated almost literally. Kent reacted by trying to explain his idea again, indicating that he meant drawing another A would be at the probability of a half. The teacher took up on his statement and reconstructed the origins of Kent's reasoning: three out of six is half. Kent resumed his reasoning, by adding that when multiplying that, the result would be a probability of one fourth. The teacher again took up on Kent's reasoning, elaborated on it and used it to arrive at the point he intended to make: the construction of a tree diagram of probabilities.

The interaction between the teacher and his students had a dialogical character. The students felt free to attribute to the conversation, to express their thoughts and even their objections to the things the teacher said. Although not all utterances of the teacher could be characterized as pedagogical, some being more recitative, the general atmosphere in the episode was pedagogical. The teacher took up on contributions of

his students and used them to discuss what he had intended to discuss, without taking away the sense of dialogism in the episode.

Table 7.19 shows the frequencies of the on-task and off-task interaction during both the experimental and the regular situation. The teacher instruction in the experimental lesson was completely on task. However, the division of on-task and off-task interaction in student interaction was still about half, just as in the regular lesson. In fact, the students were even slightly less on-task. Students in addition used fewer units of meaning; though this was probably due to the fact that the teacher took up more time with his instruction, so students had less time to work on their tasks and therefore less time to utter units of meaning.

Table 7.19: Percentages of on-task and off-task units of meaning in Mathematics, experimental and regular lesson

Mathematics	Experimental lesson		Regular lesson	
	Teacher N=196	Students N=559	Teacher N=50	Students N=739
On-task	100	47	78	49
Off-task	–	53	22	51

When looking solely at the students' on-task interaction in Table 7.20, the functions of language that occurred show interesting numbers. The percentage of the instrumental function of language was comparable to the percentage in the regular lesson. The exploratory function of language occurred in 6% of the units of meaning and the percentage of the social function of language was 9%. The percentage of the pedagogical function of language was 23% versus 14% in the regular lesson. The pedagogical function occurred much more often in the experimental lesson, especially considering the fact that this function seldom occurred in my entire research project.

Table 7.20: Percentage of functions of language in Mathematics, experimental and regular lesson

Mathematics	Experimental lesson		Regular lesson	
	Teacher N=196	Students N=263	Teacher N=39	Students N=367
Exploratory	–	6	–	5
Pedagogical	40	23	–	14
Instrumental	58	62	100	66
Social	2	9	–	15

Table 7.21 shows the percentages of the modes in which the instrumental function was used in both teacher instruction and student interaction, in both the regular and the experimental lesson.

Table 7.21: Percentages of the procedural and instrumental function of language in Mathematics, experimental and regular lesson

Mathematics	Experimental lesson		Regular lesson	
	Teacher N=117	Students N=163	Teacher N=39	Students N=244
Procedural	40	41	100	43
Content-related	60	59	–	57

As Table 7.21 shows, the instrumental function of language in the teacher instruction showed 40% procedural-related and 60% content-related units of meaning. Compared to the instruction in the regular lesson, the experimental lesson showed a much greater focus on the content. The subsequent student interaction did not change much compared to the student interaction in the regular lesson.

Verbal construction of knowledge

The teacher instruction influenced student interaction. Students incidentally referred to the teacher's explanation and even joked about it, by showing social units of meaning like: "John, if you don't understand something, I am here for you man". Secondly, the teacher interaction seemed to have some effect on the occurrence of the pedagogical function of language, which did occur quite often with 23%. In the regular situation, the pedagogical function also occurred rather often in mathematics as, compared to other lessons. The regular lesson showed that the student who provided guidance used certain units of meaning to excuse herself for the fact that she knew more than her fellow student, by claiming that she probably did it wrong too. Transcript 7.15 illustrates how the pedagogical function of language occurred in the experimental lesson. Jane had a problem with two exercises concerning a jar of multicolored marbles and the probabilities of drawing of certain colors.

J: Okay, I have a question. Should you first… (sneezes) excuse me. Should I first put these two together and then look here at… What do I have to do here?
D: What is the question?
J: These two, I don't understand them. Right here, do I have to put everything that's not blue together?
D: Yes
J: Two five three. Do I need to add or to multiply?
D: Add
J: So that plus that plus that plus that
D: No, it is one fifth plus a half is eh let's see two tenth. How much were the white ones?
J: Five
D: Five plus two is seven tenth
J: Times that plus that. And what about this one?
D: Yes, let's see. You have the jar and you need to take care that there are…

J: No blue ones
D: No blue ones in it. But in sum there are ten marbles. When you subtract the ones left
J: There are seven ones left
D: Yes, that is seven tenth. That exists of the white and the red marbles combined. So you subtract one at the start. This is white plus red, this is blue, and here another blue one and the other two, you put down here.
J: Which ones were those? Ehm…
D: White and green, white plus green
J: And what does that make?
D: Two white and a green marble out of five
J: That makes three fifth
D: Four oh six oh seven
J: And then you just…
D: Then you do this plus this, times…. Then you do the same as usual
J: Okay
(1.0.0)
D: So it is twenty-one fiftieth
J: That is weird
D: It is
J: The way you explain it is much better than the textbook does
D: In the end it is the same, so it doesn't matter

Transcript 7.15: Dyad 1 – Doris and Jane in Mathematics, experimental lesson

The student interaction in Transcript 7.15 showed, besides some instrumental questions and answers, a number of pedagogical sequences. The interaction started with an explicit call for guidance, by Jane's "Okay, I have a question". The fact that Jane started her sentence with 'Okay' indicated that the fact that she asked for intellectual guidance was not out of the ordinary in this student conversation. After both students established in which exercise Jane had problems, Jane asked a number of questions concerning her first problem that were directly answered by Doris. When she raised the questions on her second problem 'And what about this one?', the interaction became of a more pedagogical nature. Doris and Jane first specified the problem within the exercise 'You need to take care that there are no blue ones in it'. Doris subsequently determined what the boundaries of the task were and started her explanation in which Jane's contribution in everyday language, 'There are seven ones left', received uptake by Doris and was rephrased into mathematical terminology, 'Yes, that is seven tenth'. In addition, Doris explained where this mathematical notion originated from. In the sequence that followed, Doris formulated the first step of a calculation as an answer to Jane in everyday language. This time Jane herself rephrased Doris' contribution in everyday language into mathematical terminology: 'That makes three fifth'. In this sequence, both students mirrored the previous sequence, indicating that Jane had actually constructed new knowledge through verbal interaction.

The transcript ended with an evaluation by Jane of Doris' guidance skills. She expressed that the explanation Doris gave was much better than the book's

explanation. By articulating the fact that Doris had provided intellectual guidance and even commending her for it, she attributed a status of a proper way of interacting to the pedagogical episode. However, by mentioning it, it seemed that the occurrence of the pedagogical function of language was still marked as out of the ordinary, but was treated as less inappropriate behavior than it was in the regular lesson.

The teacher instruction changed something in the implicit values of the relationship between the students. In the regular lesson the pedagogical function of language occurred in combination with utterances that were meant to diminish the sense of hierarchy between students. In the experimental lesson, these utterances did not occur anymore. It appeared that the pedagogical function of language not only occurred more often, but was also more accepted as a proper way of interacting in seatwork.

7.4 Conclusions and discussion

7.4.1 Conclusions

The question that was central to this study was:

> Does changing the teacher instruction to one containing more content-related and exploratory functions of language, result in student interaction with more content related and exploratory functions of language when working independently on textbook tasks?

To answer this question three cases were studied, each containing a regular lesson in which no changes were made to the natural situation, and an experimental lesson, in which the teacher instruction was altered based on well defined criteria as discussed in Section 7.2.2. In Economics, the change of the teacher instruction succeeded. In History the teacher instruction did show more units of meaning, however the content of the teacher instruction disregarded the content of the task. The nature of the interaction was still predominantly procedural-instrumental, except for one exploratory remark on the use of explaining. In Mathematics, the teacher instruction changed towards a more pedagogical oriented instruction.

The central question can first and foremost be answered based on the Economics case, since this case was the only case in which an exploratory change of the teacher instruction succeeded. Student interaction in the experimental lesson showed more on-task interaction, although the teacher instruction was actually less on-task. Student interaction furthermore showed more content-related interaction, more exploratory units of meaning and also noticeably more pedagogical units of meaning. The way students dealt with the verbal construction of knowledge in their interaction, however, only differed slightly from the regular situation. Exploratory units of meaning did not always receive exploratory uptake. The nature of student interaction appeared to be influenced by a more exploratory and content-related teacher instruction, however,

only to a certain degree. The changed instruction did not change the primary values students adhered to, which consisted of a focus on the proper procedure.

The importance of the values students adhered to in their interaction in seatwork can be seen in the History case. In this case, the teacher instruction changed only minimally. The teacher instruction was still procedurally instrumental in the experimental lesson, however, it contained one instance of the exploratory function of language, in addition to the instruction being considerably longer than in the regular lesson. Student interaction in both lessons showed exploratory instances, in the experimental lesson slightly more than in the regular lesson, but the differences in overall occurrence of function of language were not very remarkable. The exploratory utterances however, had one thing in common: In all cases students used phrases to downplay their intellectual contribution and exploratory utterances were often ignored. Students treated exploratory interaction as inappropriate behavior, as not part of the proper way of interacting in seatwork.

The influence of values concerning what behavior is adequate and what is not, could also be seen in the case of Mathematics. In the regular lesson of this case, student interaction showed a number of instances of the occurrence of the pedagogical function of language. Students excused themselves, however, when assuming the role of a more knowledgeable peer by contributing utterances that downplayed their intellectual contribution and by doing so minimized the hierarchical difference that had occurred. In the experimental lesson in which the teacher had explicitly stated that he expected students to guide each other, this downplaying behavior did not occur anymore, although the occurrence of pedagogical interaction was still marked as out of the ordinary. Students joked about it to each other, and explicitly referred to the occurrence of intellectual guidance.

The Mathematics case however also showed something else. The teacher interaction was changed towards stimulating the occurrence of the pedagogical function of language. The subsequent student interaction showed the same effect as the Economics case, however, in this case concerning the pedagogical function of language. Students' interaction showed considerably more pedagogical interaction. The occurrence of the exploratory function however stayed more or less the same. In addition, students did not interact more content-related within the instrumental function of language.

In conclusion, in the lesson in which the teacher instruction changed into one that was more content-related and exploratory or pedagogical, the subsequent student instruction also showed more content-related, exploratory and pedagogical interaction. This confirms the idea that the nature of the teacher instruction influences the subsequent student interaction and that student interaction can be influenced by changing the teacher instruction. The fact that the History case, in which the teacher instruction did not change, resulted in an unchanged student interaction, adds to the idea that the teacher instruction influences the nature of student interaction.

It has to be stated, though, that there appeared to be a limit to what teacher instruction can change. Student interaction in seatwork is after all a product of the absorbing of the beliefs, values and knowledge students encountered in their educational experiences (Lortie, 1975; Stuart & Thurlow, 2000). Students have been

entering the community of discourse of the school for many years, the systems of knowledge and values and the accompanying ways of interacting do not change because of one changed teacher instruction. Still, every change in a community of discourse has to start somewhere.

7.4.2 Discussion

The teacher instruction appeared to be difficult to change, even if I only aimed at a change of actions, instead of beliefs. It appeared to be quite difficult for the teachers to deviate from their usual ways of interacting. This not only applied to the History teacher, but also to the Economics and Mathematics teacher. The cases in which a change of a teacher instruction succeeded, were cases in which the teacher instruction already showed the exploratory and the pedagogical function of language. The change of teacher instruction in these cases could therefore be considered more of a shift, or a push into the direction these teachers were already heading. The change I proposed did not necessitate both teachers to use language in a new way, but only to emphasize their language use. In this respect the change I asked from the History teacher was a much greater effort. To him, the different teacher instruction meant having to use language in a very different way. In perceiving teacher instruction in terms of communities of discourse, it could be argued that teachers' language use could not be changed, since this was rooted in the community of discourse the teachers were a part of.

CHAPTER 8

Conclusions and discussion

8.1 Introduction

The central question of this exploratory study was: 'How do students verbally interact when working independently from the teacher and how does student interaction relate to the instruction they received?' Since the 1998 educational reform that installed the Study House, independent working in one form or another is frequent practice in Dutch classrooms, the most common form being seatwork. Seatwork is a teaching method in which students work on their own, usually on textbook tasks, often prescribed by the teacher. The social setting in which this teaching method is conducted plays an important role in students' independent working. Although individual products and individual efforts are expected, the work is usually done in a setting in which other students are working independently at the same time, often even on the same tasks (Anderson, 1984). Seatwork is therefore seldom done individually. In practice this teaching method often takes the shape of collaborative working in dyads on tasks designed for individual completion.

Many studies have been conducted into classroom interaction, often focusing on teacher-student interaction or on student interaction in a situation designed as collaborative learning to elicit verbal construction of knowledge. Student interaction in seatwork, however, is a much more spontaneous form of interaction. In this research project, I explored this much practiced but little studied situation, with a focus on how students verbally construct knowledge.

I worked from the assumption that learning can be characterized as entering a discourse (Bruffee, 1986). As Bruffee argued, learning is learning the way of talking, thinking and reasoning as constructed by a particular group of people, i.e. a discourse community. By learning to talk the way members of a discourse community talk, a person becomes a member himself. In this study 'discourse communities' are defined as groups of people sharing more or less the same systems of values and knowledge (Halliday, 1993). Within every discourse community, a usually tacit agreement exists about what counts as valid knowledge, argument and example (Van Veen & Van de Ven, 2008). Communities of discourse are constructed by the collective interactions of people, today and in former times. Each member adds to the defining characteristics of the community by participating in it through interaction with others (Bruffee, 1984).

In my studies I perceived the classroom as an environment in which different communities of discourse can come into play. One of these discourse communities is that of the school. This community contains shared systems of values and knowledge that are characteristic for education; for instance values regarding how to behave as a student and regarding what counts as learning and as knowledge. A second discourse community is that of the school subject, in which systems of knowledge and values of for instance History or Mathematics come into play.

I perceived students as learners who enter the discourse of one or more communities; sometimes under explicit guidance of the teacher, on other occasions with peers, for instance when working independently from the teacher. Verbal interaction plays a crucial part in the students' entering a discourse. In interaction with others, students encounter other communities in exploring each others points of view and resolving conflicting perspectives. The occurrence of conflicting perspectives is considered especially promising for the entering of a discourse and therefore for the verbal construction of knowledge, since they could result in students stimulating each other towards further exploration, e.g. by argumentation and giving examples (Bakhtin, 1981; Nystrand, 1997b).

In my studies I explored how students interacted and whether they verbally constructed knowledge. I furthermore explored how teachers instructed their students. I described both in terms of the functions of language that occurred in student interaction. The teacher instruction was furthermore described using Nystrand's (1997b) 'monologically organized instruction', which takes the shape of recitation and 'dialogically organized instruction', which takes the shape of a coherent conversation in which topics are discussed instead of addressed. Both forms of interaction were interpreted in terms of the entering and constructing of communities of discourse.

My research project consisted of three studies. The first two were naturalistic studies, in which I investigated student interaction in two different forms of small group work (cf. Nystrand & Gamoran, 1997). The first one was seatwork, in which students worked collaboratively on textbook tasks meant for individual completion. The second was a form of small group work in which students collaborated on complex, open-ended tasks they constructed themselves with guidance from the teacher, comparable to Nystrand and Gamoran's (1997) 'autonomous problem solving'. The third study was an experiment to try to change student interaction in seatwork in such a way that it contained more exploratory units of meaning. In order to analyze student interaction in these three studies, I constructed an analytical framework based on both prior research and my own data.

This chapter presents the main conclusions of these studies. In Section 8.2, I first present the conclusions regarding the analytical framework, after which I present the main conclusions of each separate study and answer the main research question. In Section 8.3 the conclusions are discussed.

8.2 Main conclusions

Pilot: constructing an analytical framework

In order to answer my research questions on the nature of student interaction, I needed an analytical framework. Chapter 4 reported on the construction of this framework. In the analytical framework, four functions of language in interaction were distinguished. They were described based on characteristics found in theoretical as well as empirical studies into classroom interaction, and adjusted based on my own data. The characteristics of every function concerned typical speech acts, interactional patterns and general attitude students displayed in their interaction. In addition, they concerned the a rough indication of the conversational topic in a division in on-task and off-task interaction.

The language functions could be considered integrated, meaning that one utterance could and probably would have several functions in interaction between people. However, in my study, I worked from the assumption that every unit of meaning contained one dominant function, depending on the context in which it occurred. The four functions of language I distinguished were the following:

- Social function – language primarily used to construct a certain social relationship between speakers
- Instrumental function – language primarily used as a vehicle for getting somewhere, verbally pursuing and establishing a goal in reality. This function occurred in two modes:
  - content-related mode, language primarily used to transmit knowledge
  - procedural mode, language primarily used to establish the proper way to act
- Pedagogical function – language primarily used to seek and provide intellectual guidance
- Exploratory function – language primarily used for the transformation of understandings

The pilot study showed that in every utterance, one dominant function of language could be observed. The analytical framework appeared to be suitable for the description and analysis of interaction in situations in which students worked independently. However, since the situations I studied differed from each other, I started every new round of analysis with checking and adjusting the analytical framework to the data I obtained in that situation. This resulted in an analytical framework that can be used for analyzing language of both students and teachers in different educational situations in which students work on their own. The analytical framework, containing the adjustments of every study, is presented in the appendix.

Study 1: Student interaction in seatwork

The first study into student interaction was presented in Chapter 5. The central question of this chapter was: 'How do students verbally interact with each other in seatwork?'

Study 1 showed that students interacted both on-task and off-task, but that most of their interaction was focused on the task. In on-task interaction, all four functions of language occurred. Students used language mostly as an instrument to complete their work, showing a strong focus on establishing the proper procedure. How to work, and what to work on, appeared to be the dominant issues in student interaction. These issues appeared to be so influential that they obstructed the verbal construction of knowledge. Situations in which conflicting perspectives arose or situations in which the exploratory function of language occurred were either ignored or cut short by fellow students referring to the proper procedure of the task. The occurrence of exploratory interaction was treated as unnecessary and even inappropriate behavior.

The question that arose was why students interacted this way. It appeared that both the teacher instruction and the written task instruction that students received prior to seatwork showed similarities in language use as compared to student interaction. The teacher instruction was predominantly focused on what students were to do and how they were to do it, and predominantly showed procedural-instrumental language, as did the written instruction. In the study that followed, I decided to investigate the relationship between student interaction and the instruction students received.

Study 2: Student interaction in collaborative learning

The second study into student interaction was described in Chapter 6 and focused on the question: 'What aspects of teacher and task instruction influence students' language use in collaborative learning as compared to seatwork?' This chapter described how students interacted when working independently from the teacher in form of small group work aimed at stimulating student autonomy in learning, through an open ended task and a different role of the teacher. Both could be considered especially suited for the verbal construction of knowledge. I studied this situation to see how the teacher and the task instruction related to student interaction.

Despite the different task and teaching method, few differences could be observed in student interaction in collaborative learning as compared to seatwork. Student interaction predominantly showed procedural-instrumental language, which obstructed the verbal construction of knowledge. Answers were considered relevant when they could add to the report students had to write, but irrelevant when they could not. Conflicting perspectives on content related matters were dealt with as conflicts about procedures between different authorities, e.g. teacher and school subject. They were solved by establishing which authority had the most status and should thus be followed. This procedural focus of the students showed many similarities with student interaction in seatwork.

Although the task was designed to be open-ended and complex, students themselves turned it into a closed task requiring a right-wrong answer, which was discussed accordingly. The nature of the task therefore appeared to be not a sufficient factor in stimulating the verbal construction of knowledge in student interaction.

The teacher instruction confirmed the students' interpretation of the task and appeared to be a rather influential factor. The teacher instruction influenced student interaction in three ways. The first influence concerned the content of the units of meaning of the teacher. Students often referred to his exact words. Students appeared to follow the instruction meticulously, and put a lot of emphasis on contributions of the teacher. The second influence became clear in the similarity between teacher and students' language use. In both, instrumental interaction occurred most often in the procedural mode. Student interaction showed the same frequency of occurrence, and the same focus on procedural aspects as teacher instruction. The way the teacher dealt with exploratory interaction was reflected in the way students dealt with exploratory utterances. These were only regarded valid when they could add to the final product and were disregarded when they could not. The third way in which the teacher's language use appeared to influence student interaction, concerned the values of the community of discourse the teacher reflected. These appeared to be actively incorporated and reflected by students in their subsequent interaction. The teacher's values even influenced the way students interpreted the teacher's language use in retrospect, coloring dialogic episodes as monologic.

To investigate whether the influential aspects I distinguished could be used to influence student interaction towards containing more instances of verbal knowledge construction and a different use of language, I designed an experiment with teacher instruction, which I conducted in my third study.

Study 3: Experimenting with seatwork interaction

The third study into student interaction was described in Chapter 7. This chapter reported on an experiment focusing on the central question: 'Does changing the teacher instruction to one containing more content-related and exploratory functions of language, result in student interaction with more content-related and exploratory functions of language when working independently on textbook tasks?'

It proved no easy task to change teacher instruction. In fact, the teachers that did change their instruction according to my guidelines, already interacted using these functions of language before my intervention. The change in the instruction of these two teachers therefore was not so much a change, but rather an emphasis on an already existing aspect of their language use. For the teachers who's own language use was predominantly procedural-instrumental, the change was much more radical and in fact did not succeed.

The change in teacher instruction did result in different language use in student interaction. In the case in which the teacher instruction focused on exploratory interaction, student interaction showed more instances of exploratory interaction. In the case in which it focussed on pedagogical interaction, student interaction showed more instances of both pedagogical and exploratory interaction. Despite the increase in

the occurrence of exploratory and pedagogical interaction, the way students dealt with the occurrence of these functions was often comparable to the regular lesson. In many cases, student interaction showed that occurrences of the exploratory and the pedagogical function were marked as out of the ordinary or as inappropriate behavior.

Central question

The central question of my research was: 'How do students verbally interact when working independently from the teacher and how does student interaction relate to the instruction they received?' The interaction in both seatwork and collaborative learning was similar. Students interacted predominantly in a procedural-instrumental way. Instances of verbal construction of knowledge occurred in interaction in both teaching methods, but they were often interrupted or discarded because of procedural considerations. Student interaction mirrored the interaction of the teacher, which was also predominantly procedural-instrumental in nature. The nature of the teacher instruction confirmed the procedural interpretation of the students, by its procedural focus and its monologically oriented use of language.

The conclusion that students mirrored the language use of the teacher corresponds with the findings of Tartwijk, Brekelmans, Wubbels, Fisher and Fraser (1998), who argued that the way teachers deal with their students is reflected in students' behavior. Students tend to act the way their teacher acts. The way the teacher *inter*acts seems to have the same result: Students use language the way the teacher uses language.

This finding can be explained in view of social-cultural theories on learning. As Vygotsky (1978) argued, learning is the process by which learners are integrated into a culture, or in terms of Bruffee (1986), enter a discourse. Language is the primary means with which children are enculturated and with which adults act out social structure, affirming their own statuses and roles, and establishing and transmitting shared systems of values and knowledge (Halliday, 1993; Vygotsky, 1978). What a teacher does by instructing his students is more than telling them what to do. The teacher reflects social structures, he affirms his status and his role and more importantly, he establishes and transmits shared systems of value and knowledge, which are an inherent part of the community of discourse the teacher is a representative of.

The system of values and knowledge the teachers in my study established and transmitted in their instruction, did not seem to be necessarily related to the school subjects they taught. Teachers primarily acted out their social roles as teachers and defined the roles of the students. The values they established and transmitted were procedural values such as: 'Knowledge is a given and it is constructed by authorities', 'Answers are either right or wrong' and 'The textbook and the teacher are important authorities'. In addition, values concerning how students were to work independently were transmitted: 'Working correctly is important' and 'Acting properly is a central requirement'.

Student interaction showed the incorporation and acting out of these values. Students showed self-correction and the correction of others in situations in which these values were transgressed. This happened for example when students interacted

off-task, but also when the exploratory function or the pedagogical function of language occurred. Students were very prone to doing it 'right'. This attitude however in practice did not mean finding a correct answer or conducting a good study, but working according to the procedures the teacher or the textbook prescribed. In their interaction, students mirrored the teacher's instruction. Teacher instruction mirrored the dominant discourse in the classroom which was the discourse of the school and education in general.

8.3 Discussion

Limitations

When interpreting the above conclusions, some preliminary considerations have to be made. In the seatwork studies, only teacher instruction was taken into account. However, teacher interaction usually consists of more than just instruction. A teacher perhaps explains subject content, he chats with his students before the lesson starts, he ends the lesson by providing homework. All these other instances of teacher interaction could also influence the way students interact when working independently from the teacher. This study focused on the relationship between teacher instruction and student interaction from a discourse perspective, meaning that the relationship was only studied in terms of the verbal interaction that took place. It is quite possible that other factors play a role in the construction of a community of discourse, which have not been taken into account in this study.

In my research I have only studied interaction. Although other studies link a certain way of using language to learning, I have not studied whether or not the verbal construction of knowledge actually leads to a deeper and better understanding in students. The results of this study therefore have to be interpreted while keeping this in mind. My study only provides an indication of the knowledge that is visibly constructed in student interaction. No conclusions can be drawn on what or how much a student learned from the interaction. Finally, the generalizability of the results of this study is limited. It offers a small-scale exploration into the interactional dynamics of a specific form of classroom discourse. In sum, only nine teachers and twenty-four students were studied in three studies on three schools.

Entering a discourse

In interpreting the results of my studies, I worked from the metaphor that equates learning to entering a discourse (Bruffee, 1986). Learning is becoming a member of a community of discourse by learning to speak and think the way members of this community speak and think. Three different communities of discourse appear to play a role in the interaction that surrounds independent working. The first community is the community of discourse of the school subject which students are supposed to enter. The learning of students in certain school subjects can be interpreted as learning to speak the language of that particular knowledge domain. The teacher is considered the

representative of the discourse community of the school subject he teaches. In that light, student interaction when working independently from the teacher can be considered an opportunity to practice the discourse the teacher is a representative of. The second community is the discourse community of the school and education in general. This community contains the discourse: The systems of knowledge and values that play a role in the everyday organization of the classroom. It contains definitions of the participants' roles and values concerning learning and knowledge. The third community is the community of the scientific educational discourse, in which values like autonomy, ownership, dialogism and exploratory interaction are emphasized as elements that supposedly facilitate and enhance learning. This community contains values on what education should be like, including the notion that students can be made to enter a different discourse.

Although the community of discourse of the school subject could play a part in education, it appeared that this community was not entered in student interaction. The school discourse was dominant to such an extent that it seemed to overrule the discourse of the school subject. As a result, the discourse of the school subject hardly occurred at al. The teacher, too, was a member of the community of the school, reflecting mainly the discourse of the school in his instruction, and in doing so confirming the students' interpretation of what the proper discourse was.

The discourse of the school and education in general, with its procedural values, did not match the scientific educational discourse. The project in study 2 was based on this scientific educational discourse. In interaction in collaborative learning, the scientific educational discourse appeared to conflict with the school discourse of students and teachers. As discussed in Chapter 2, every community of discourse protects itself by not only defining what is valid in a certain community, but also what is considered not valid and rejecting these elements. The school discourse obstructed the entering of the new discourse as much for the teacher as it did for the students: neither one entered this new community.

In fact, it can be debated whether students *entered* a community at all. The discourse that student interaction reflected in all my studies was the discourse of the school, and it appeared that this was not a community students were entering, but a community they were already a member of. Learning might be perceived as entering a discourse, but in the everyday practice of my studies student interaction predominantly reflected students' membership of the discourse community of the school, not their entering.

Monologically oriented teacher instruction

The analysis of the teacher instruction showed that the teachers I studied predominantly adhered to traditional values, even in the second study in which the teaching method and the task called for different values, especially concerning knowledge. In terms of Nystrand's (1997b) findings, the teacher used 'monologically organized instruction', implying a transmission perspective of learning in a situation that called for 'dialogically organized instruction'.

One of Nystrand's (1997b) concerns with this type of teacher interaction was that in monologically organized instruction, diversity and conflict are suppressed by the perception of knowledge as something that is transmitted, which risks disengaged, off-task students. This study can add to Nystrand (1997b) that this type of teacher instruction not so much suppresses diversity and conflict, since instances of verbal knowledge construction and of conflicting perspectives did occur in all studies, but rather that it appeared to result in the active disregarding of these opportunities for verbal knowledge construction. Teacher instruction did not suppress students verbal construction of knowledge; it appeared to cause students to suppress these instances in their interaction themselves. The monologic teacher instruction resulted in procedurally focused students who were engaged and on-task, however not concerning the school subject. As Atwood *et al*. (2010) argued, verbal interaction in the classroom not only constitutes communities of discourse but also displays how the community is constructed and the degree to which learning processes are valued as being constitutive of knowledge.

The question rises why the teachers in my study showed a predominantly monologically oriented instruction and a procedural focus. A first explanation could be the long tradition of monologically oriented language use in schools (Nystrand, 1997c). Teachers are a product of their own predominantly recitative educational experience and have assimilated the educational values that they experienced themselves in an apprenticeship of observation (Knippenberg, 2010; Lortie, 1975). Recitative education has for many years been the foundation of everyday classrooms. Teachers themselves have been educated in a monologic tradition, constructing systems of knowledge and values concerning the notion of 'school' as they entered the community of discourse their teachers also adhered to. The knowledge and the values these teachers constructed, they now reflect themselves as representatives of not only the school subject they teach, but even more so of the school system they are part of.

The school discourse, with its focus on procedures and its perception of the world in notions of right and wrong, is not only reflected in the Dutch educational system. Society as a whole is a member of this same discourse. Learning is quantified and perceived in terms of outcome. Politicians focus on the number of school subject profiles that are offered instead of their content, school leaders manage their teachers on the number of hours they are allowed to be engaged in teaching and often measure teacher success in terms of student grades, not in terms of teaching ability or proficiency. Society pushes in the same direction, and has the same procedural and product-oriented view on learning.

Another possible explanation for the predominantly monologic interaction the teachers in this study showed, can be found in Ehlich, Rehbein and Ten Thije (1993). They describe that in certain pedagogies, a teacher is put in a position in which he has to strive for two conflicting aims. On the one hand he aims to let students discover things for themselves, yet on the other hand he needs to make sure that a student learns the right things. This conflict could be at the heart of the teachers' recitative language use; especially in the second study, in which the teacher's language use could be characterised as monologic in a teaching method explicitly calling for dialogic interaction. The teaching method posed the teacher with a considerable dilemma:

Letting the students indeed conduct their own study, or correcting them when they appeared to follow the wrong trail. Since many aspects in education focus on learning in terms of outcomes, it is understandable that the teacher mainly focused on the latter, which led to predominantly monologically organized instruction. Even though the teacher from time to time switched to a more dialogically organized instructional style, students still interpreted his utterances as monological. It seemed that when students had determined what the correct way of interacting was, all deviating interactional styles were disregarded; not only in their own interaction, but also in retrospect in the teacher instruction. The long years of participating in the dominant school discourse overruled glimpses of more dialogically oriented interaction.

Teachers as change agents

One of the main issues on the political agenda today is the quality of Dutch education (cf. Leraar 2020 – een krachtig beroep!, 2011). The concept of 'quality' in this debate is perceived in two opposing ways. On the one hand 'quality' is perceived as the extent to which students learn to learn, in view of the idea of a life-long learning as was aimed at with the implementation of the Study House. On the other hand 'quality' is perceived as the extent to which students' output can be considered sufficient in terms of surveys like PISA (Gille *et al*., 2009). The contemporary discussion focuses more and more on the latter perception, questioning whether students sufficiently acquire knowledge and proposing reforms to increase knowledge acquisition.

In the concept of 'learning to learn' of the Study House, the everyday reality of the classroom, in which the discourse of the school and education in general is dominant, was not taken into account. My studies showed that the discourse of the school obstructed most attempts to enter a different discourse. Shifting focus solely to students' output, as proposed in the contemporary discussion, disregards educational aims like teaching students things like reasoning, experimenting and critical thinking. In conducting this discussion about the quality of Dutch education, it is crucial to make explicit the aims of education (cf. Bolhuis, 2000) and construct fitting ways to realize them.

The perception of knowledge as a given, as part of the discourse of the school and education in general, can be very functional in learning things like grammar and calculus. However, when this discourse and the values it contains obstructs the entering of other discourses, the community of discourse of the school can become problematic. This discourse does not deserve to be discarded, but needs to be expanded to also include knowledge construction by students using cognitive skills such as reasoning and experimenting. The question is whether a change in discourse can be brought about at all, by external forces alone. Initiatives to change the discourse, like new curricula, new teaching methods and different tasks, are absorbed and translated into the language of the existing community. This prevents teachers from entering different communities of discourse , who in turn, prevent their students from entering them.

In reconstructing the educational discourse community, teachers need to be active participants (Van de Ven *et al*., 2005). They may be stimulated to do so when they learn

how their instruction and interaction influences students' interaction in schools. It is important that teachers become aware of their own contribution to the social construction of reality and how their language use reflects their system of values and knowledge. Moreover, they need to become conscious of the fact that they are perceived by their students as the representatives of knowledge and learning in the classroom and that the way they interact is regarded the proper way by their students, not only concerning what they say, but also concerning how they say it. When teachers become more conscious of this process, they can discuss with each other whether their way of interacting meets their educational aims. The framework I constructed with the functions of language may be helpful as a tool in the process of becoming aware of one's language use, creating an opportunity for exploring change.

Further research into the practice and the language use of teachers could be used to study how teachers could be motivated to take part in actively expanding and reconstructing school discourse, and possibly introduce students to the discourse of the school subject. A good place to start the reconstruction of the school discourse would be in the teacher training institute. However, without a change of the everyday practice of the school, a reconstructed discourse would be overruled by the existing one. Therefore, a combination with raising teachers' interest in studying their language use for themselves would be of vital importance. The construction of learning networks of teachers, for instance, in which teachers conduct research into their practice (Martens, 2010) in collaboration with researchers and fellow teachers, could be a way to bring this about. When teachers have dialogic conversations with each other within both the scientific educational discourse community and the discourse community of the school, they may learn from each other and at the same time provide an environment in which a reconstructed discourse can blossom. When teachers co-construct a discourse in which the verbal construction of knowledge is a valid way of interacting, they can also guide their students into this different and promising discourse.

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Appendix

An analytical framework for interaction during forms of independent working, as used in study 1 (dark grey), study 2 (light grey) and study 3 (white).

	Social function Language used to exchange meaning. Verbally constructing and maintaining social relationship.	**Instrumental function** Language used to exchange meaning as a vehicle for getting somewhere. Verbally pursuing and establishing a goal in reality.	**Pedagogical function** Language used for providing and seeking intellectual guidance.	**Exploratory function** Language used for the verbal construction of knowledge.

Conversational topics	• On-task
	  ○ The research subject
	  ○ Methodology
	  ○ Writing
	  ○ The collaborative learning project
	• Off-task – personal matters
		• On-task
		  ○ The research subject
		  ○ Methodology
		  ○ Writing
		  ○ The collaborative learning project
			• On-task
			  ○ The research subject
			  ○ Methodology
			  ○ Writing
			  ○ The collaborative learning project
				• On-task
				  ○ The research subject
				  ○ Methodology
				  ○ Writing
				  ○ The collaborative learning project

Speech acts	• Asking • Answering • Asserting • Counterasserting • Repeating • Confirming • Joking • Making personal associations • Sharing personal opinions	• Asking • Answering • Asserting • Counterasserting • Stating • Counterstating • Repeating • Confirming	• Explaining • Elaborating • Providing arguments • Requesting clarifications • Justifying • Questioning • Counter questioning • Clarifying • Challenging • Counterchallenging • Negotiating	• Explaining • Elaborating • Providing arguments • Requesting clarification • Hypothesizing • Justifying • Clarifying • Challenging • Counterchallenging • Representing • Agreeing • Validating • Reasoning • Articulating propositions • Comparing
Interactional patterns	• Fact sharing • Exchanging meaning • Articulation • Short and longer exchanges	• Exchanging meaning without visible alterations • Articulating • Fact sharing • Choppy interaction	• Gaps in knowledge are recognized • Reasons and evidence are weighed • Subject material is rephrased and clarified • Concepts are reorganized and clarified, misconceptions are recognized • Reasons and evidence for and against positions are provided	• Questions are discussed • Answers are hypothesized • Long turns • Fluid interaction • Uptake • The contributions are in coordination with each other

Interpersonal actions	• Creating a shared sense of relation • Exchanging meaning		• Exchanging meaning • Establishing a goals concerning a task • Pursuing a goal concerning a task • Function may hinder learning, by being constraining or too peaceable		• Hierarchical relation • Mutual sympathy and affection • Cooperative relationship, defined by reciprocity, discussion, mutual respect and by attempts to coordinate one's own views with those of others	• Open attitude • Explorations receive uptake • Participants are equal contributors to the conversation • Language as a joint construction of meaning • Solving of conflicts • Airing of diverse perspectives - a collective resource for the interaction • Conflicting perspectives are clarified in interaction • Conflicting perspectives are considered a valued source for the construction of knowledge, instead of a breach with the knowledge that is considered correct
			Procedural mode Language used to establish the proper procedure Language used to perform certain actions: • Discussing the procedure • Coordinating action • Initiating • Referring to text	**Content-related mode** Language used to complete the task Language used to perform certain actions: • Formulating the answer • Discussing the answer • Discussing the content of the task		
Study 1	**Off-task social**	**On-task social**	**Procedural-instrumental**	**Content-related instrumental**		
Positive examples	'Hey, there is Sinterklaas!' 'No, that's Santa'	'I think we are quite far' 'Yes we are'	'Did we have to work on 6 and 7 or on 8?' 'I thought 5'	'Turdus Merula' 'Singing bird'	'What is own capacity?" 'That depends on what you have here, you see?'	'They worshipped one god' 'No the Aztecs had several, if they had a god of rain, there probably would have been more'
Negative examples	(Points at textbook) 'He has long slats' 'Long slats, long arms'	'Do you have French today?' 'Yes, seventh period'	'The answer to 1 is 'many'' 'What?' 'Many'	'It is about when use you what' 'Oh, do they mean it like that'	'They don't mind dying' 'Why not?' 'She asks'	'People who were sacrificed faced a happy existence' 'Where does it say that?'

Study 2	**Off-task social**	**On-task social**	**Procedural-instrumental**	**Content-related instrumental**		
Positive examples	'My locker is my life, I keep everything in there' 'I can see'	'Mr. Prince is in the library' 'Okay, let's go ask him'	'I would not complicate things, it is just a free project' 'But the grade counts double'	'It is about economic growth' 'That it is good of the economy'	'But what if we would do that? Would we get four point one point one?' Yes, indeed, but we only have four point one and four point two'	'Ireland has a higher employment rate, so you can't compare. And Ireland is much bigger, you should consider that too. The Netherlands are small.' 'Yes, but Ireland is not bigger, it has more land compared to its number of inhabitants'
Positive examples	'We are showing excellent progression!' 'Yes, we are'	'What school subject profile do you have?' 'Nature and Technology'	'The workmaster should not evaluate our reflections, right?' 'I don't know'	'Look, I found a good article!' 'You already had that one'	'Aren't Turks Dutch employees?' Many Turks come from Turkey. Exactly the same as the Poles in a way'	'The counterargument is that it would be bad for the economy. That is the sentence' 'Okay, not good for economy'
Study 3	**Off-task social**	**On-task social**	**Procedural-instrumental**	**Content-related instrumental**		
Positive examples	'I am going to a games convention, Magister and Games' 'Cool'	'That's a long exercise' 'Yes, and lot's of work'	'Do we have to make this assignment?' 'We have to discover how this works'	'There it says net income' 'No there it says all deductions from gross income'	'So what do you have to do here?' 'What is the question?' 'See, these two I get, but here, do you have to add everything that's not blue?'	'And then we need to divide this 10,000 by 12, to see what he pays per month, right?' 'I don't think so. No, because here it says that interest is paid at December 31rst.'
Positive examples	'Can you help me already, I am completing the entire task on my own.'	'If I score a one, I will still advance to the next year' 'Yes, me too'	'Something with Africa and America' 'Triangular trade is eh a way of trading between Africa, it says'	'So one does this part, until here and the other one does until there.' 'You start'	'But it says tax obligation, so you have to pay, right? Then it has to be put in this spot' 'Yes, but here it is not meant as payment, I think'	'So, a lot of interest is added' 'That's because you don't pay till the end of the year, so you'll have January, February, March, April, May and June. That's six months.'

Summary in English

Mirroring interaction
An exploratory study into student interaction in independent working

Independent working in the Netherlands is a teaching method of increased popularity since the Second Cycle educational reform of 1998. Situations in which students work independently from the teacher are used to teach students to take responsibility for their own working and learning process. In these situations, students primarily work on textbook tasks. Although these tasks usually have an individual character, they are carried out in a social setting. Other students usually work more or less on the same tasks at the same time. Interaction among students is usually allowed and sometimes even stimulated.

Although many studies have been conducted into student interaction in the classroom, student interaction during independent working in the final years of Dutch secondary education has rarely been studied. This research project therefore focussed on this particular situation, answering the question: 'How do students verbally interact when working independently from the teacher and how does student interaction relate to the instruction they received?'

This research project is conducted based on a so called 'emergent design' (Patton, 2002), resulting in three studies into student interaction during different forms of independent working. The project started with an explorative study into student interaction in seatwork in the regular classroom situation. Based on the results of this study, a second study was conducted into a different form of independent working, being collaborative learning. This study focussed not only on student interaction, but also on teacher instruction. The results of both the first and the second study resulted into the third study in which a small-scale experiment was conducted with three teachers to influence student interaction during seatwork.

The interaction of students and teachers was analysed based on Mercer's (2004) proposal for 'socio-cultural discourse analysis', a methodology in which different approaches are used, both quantitative and qualitative. This study opts for a combination of a quantitative analysis of student interaction using a conceptual framework of language functions, in combination with a content analysis of the interaction itself.

The conceptual framework that was used to classify the interaction of the students was constructed on the basis of a combined approach of using literature and interactional data emerging from this study. It was adjusted in every study to fit the particular interactional situation. The framework distinguished four functions of language that each describe a particular use of language. These functions can be regarded as integrated, meaning that every utterance probably contains multiple functions in everyday language use. This study departed from the stance that in every utterance one function of language is dominant, in relation to the context in which the utterance was done.

The first function of language that was distinguished was the *social* function of language, in which language is used to construct and maintain a social relationship between people. The second function of language that was distinguished was the *instrumental* function of language in which language is used to pursue and establish an aim in reality. Within the instrumental function two modes of use were distinguished. Language is used *procedurally* as an instrument to establish the proper way to deal with a task and language is used *content-related* as an instrument to obtain and formulate an answer to a task. The third function of language that was distinguished was the *pedagogical* function, in which language is used to seek and provide intellectual guidance. The final function of language that was distinguished was the *exploratory* function of language, in which language is used to transform understandconstruct knowledge. For every function of language characteristic speech acts, interactional patterns and interpersonal actions were formulated to facilitate coding.

Student interaction in this study was interpreted in terms of 'communities of discourse' (Bruffee, 1984). Every person is a member of several communities of discourse, i.e. groups of people with a shared perspective on reality and their own way of speaking, or 'discourse'. Within such a community there are tacit ideas on what counts as knowledge and what are appropriate values and knowledge. At school several communities of discourse play a role. School itself can be perceived as a community of discourse, just like every school subject can, all with their own specific 'discourse'. In this study, the classroom was perceived as an environment in which students can enter these discourses and even become members of the adhering communities, by learning to speak the language of that community.

The first study was a study into student interaction in seatwork, a form of independent working, guided by the question: 'How do students verbally interact with each other in seatwork?'. In four lessons, being English, Economics, Biology and History, audio recordings were made of the interactions of student dyads when they were working independently from the teacher on textbook tasks that required an answer that was either right or wrong. Students appeared to primarily discuss the task, in about 80% of the interaction. The remaining 20% students discussed private matters. When talking about the task, students primarily used the instrumental function of language. This implies that students mostly used language as a tool to finish the task. The instrumental function of language occurred about equally in the procedural as in the content-related mode. Students used most of their interaction to clarify what they were to do.

Student interaction showed a number of situations in which the exploratory function of language occurred. However, these occurrences were either disregarded by a fellow student as not belonging to the proper procedure or they were ignored. The exploratory function of language was treated as an unnecessary and improper use of language. The question arose why this was the case. Further study into the matter showed that the nature of the teacher instruction was similar to the nature of student interaction. Only the instrumental function of language occurred in teacher instruction, and in addition, teachers focussed on the procedure that was to be followed. The content of the task and the school subject hardly played a role in the instruction.

Interpreted in terms of entering a discourse, the language use during seatwork seemed to indicate that students did not enter the discourse of the school subject, considering the fact that it hardly played a role, but entered the discourse of the school, in which knowledge on working correctly and using language in the correct manner prevailed. The fact that students corrected each other when knowledge was constructed concerning the school subject furthermore indicated that the discourse of the school hindered the entering of the discourse of the school subject.

In the second study student interaction and teacher instruction were studied in a situation in which the task was largely constructed by the students themselves and in which the role of the teacher was to be supportive and coaching in stead of instructive. This coaching occurred in individual conversations with small groups of students. The assumption was that in a situation aimed at stimulating the verbal construction of knowledge, the exploratory function of language would occur more often. This study was guided by the question: 'What aspects of teacher and task instruction influence students' language use in collaborative learning as compared to seatwork?'

Despite the differences in the two situations, the student interaction in this study differed little from the previous study. The language use of the students could be characterized as predominantly instrumental with a focus on the procedure. Problems with the task were dealt with as procedural conflict of authorities, like the teacher and the task, and were solved by establishing which authority had the most status. Although the task was presented as an open assignment, the students reduced the task to on in which the result would be either right or wrong and was discussed accordingly. The teacher confirmed the students' interpretation with his predominantly procedural-instrumental use of language in the coaching conversations.

There appeared to be a relationship betwee the language use of the teacher and the language use of the students. First, in their interaction students often referred to the exact words of the teacher. They followed his instructions meticulously and emphasized the remarks of the teacher in their own interaction. Second, the language functions in student interaction and teacher instruction appeared to be similar in frequency of occurrence. In both predominantly the instrumental function of language occurred, often in the procedural mode. The way the teacher dealt with the exploratory function of language reflected in the way students did in their interaction: the occurrence of this function was only considered valid when it could add directly to the product they were working on and was treated as improper when it could not. Third, student interaction reflected the values the teacher represented in his language use. These values con-

cerned the teachers view working correctly and the nature of a good product. Students mirrored the language use of the teacher in their own interaction.

To stimulate students to construct knowledge in verbal interaction, it appeared to be not sufficient to offer a different work setting and a different task. At least as important appeared to be the way of interacting of the teacher. When teacher instruction is predominantly focussed on working correctly and following the proper steps, in short: reflects the discourse of a more traditional form of education in a not so traditional learning setting, student interaction only reflects this traditional discourse. A new way of working with an old way of talking does not lead to new systems of value and knowledge.

In the third study a small scale experiment was conducted to discover whether student interaction could be influenced by a change in teacher instruction as compared to the regular situation. The question that was central to this study was: 'Does changing the teacher instruction to one containing more content-related and exploratory functions of language, result in student interaction with more content-related and exploratory functions of language when working independently on textbook tasks?' In collaboration with three teachers, teaching Economics, History and Mathematics, it was attempted to change the teacher instruction based on guidelines derived from the previous studies.

It proved no easy task to change the teacher instruction. Eventually two teacher instructions changed, one towards being more exploratory and another towards being more pedagogical. The third teacher instruction did not show any change. The teachers who showed a changed instruction were teachers whose instruction already contained to some degree the functions of language that was aimed for. To this respect, the change in teacher instruction was not so much a chance as it was an emphasis on already language use that was already present. Student interaction that followed after the more exploratory instruction showed more exploratory language use. Student interaction that followed after the more pedagogical instruction showed both more exploratory and more pedagogical language use. The way students treated these occurrences however hardly changed. After exploratory remarks, fellow students still pointed out the proper procedure or ignored the exploratory remarks. After pedagogical remarks meta-remarks were made that indicated that the pedagogical function of language did not belong to the usual discourse. Student interaction that followed after the instruction in which the attempted change did not succeed, hardly changed compared to the regular situation.

The question central to this study was: 'How do students verbally interact when working independently from the teacher and how does student interaction relate to the instruction they received?' The first part of this question can be answered by arguing that students used language primarily as an instrument to formulate an answer to the task, whether this task required a good-false answer or a text of multiple pages. In addition, student interaction showed situations in which students verbally constructed knowledge. These were however ignored or disregarded as improper behavior. The second part of the question can be answered by arguing that student interaction

mirrored teacher instruction. Teachers instructed their students predominantly in a procedural-instrumental way and emphasized how students were to act in working on the task, in stead of discussing school subject content.

Interpreted in terms of communities of discourse, the conclusions from the three studies indicate that the teacher was perceived as a representative of the community of discourse he guides his students into. Student interaction mirrored the language use of the teacher, not only concerning the content and concerning the functions of language he used, but also concerning the values and knowledge the teacher reflected as 'correct'. Students corrected themselves and each other when these values the teacher reflected were violated.

Three different communities of discourse appeared to play a role in interaction during independent working. The first was the community of the school subject which language students are supposed to learn to speak, the second was the community of the school and of education in general and the third was the community of the scientific educational discourse. These communities and their discourses all played a role in the studies conducted. In the first study the discourse of the school hindered occurrences of the discourse of the school subject. In the second study in which the teaching method was based on scientific educational discourse, the discourse of the school again hindered the entering of a new discourse. It can be debated whether students actually entered a discourse at all. The discourse students reflected was the discourse of the school; a discourse that they did not enter but a discourse they were already engaged in.

The third study showed that the role of the teacher is an important one in the nature of student interaction. Changed teacher instruction can lead to different student interaction. It has to be noted though that this change was not easily accomplished. The community a teacher is a member of and the systems of value and knowledge he adheres to, determine his own use of language and his own perception of learning, which eventually determine those of the students. To let students enter a different discourse a teacher has to become conscious of the influence his membership of communities of discourse has. When teachers change their use of language to fit their educational aims, they can lead their students into different communities of discourse. This is a point of attention for teacher education.

Summary in Dutch

Spiegeling in interactie
Een exploratieve studie naar leerlinginteractie bij zelfstandig werken

Zelfstandig werken is een werkvorm die in Nederland sinds de invoering van de Tweede Fase in 1998 aan populariteit heeft gewonnen. Situaties waarin de leerlingen onafhankelijk van de leraar aan opdrachten werken, worden onder meer gebruikt om leerlingen verantwoordelijkheid te leren nemen voor hun eigen werk- en leerproces. Leerlingen werken in deze situaties vooral aan werkboekopdrachten. Hoewel deze opdrachten meestal een individueel karakter hebben, worden ze in een sociale setting uitgevoerd. Andere leerlingen werken tegelijkertijd aan meestal dezelfde opdrachten; onderlinge interactie is over het algemeen toegestaan en wordt soms zelfs gestimuleerd.

Hoewel er veel onderzoek is verricht naar leerlinginteractie in de klas, is leerlinginteractie in de specifieke situatie van zelfstandig werken in de bovenbouw van het Nederlandse voortgezet onderwijs nauwelijks onderzocht. Dit onderzoek richt zich daarom op deze specifieke situatie en heeft als centrale vraag: 'Hoe praten leerlingen met elkaar wanneer ze onafhankelijk van de leraar aan het werk zijn en hoe verhoudt hun interactie zich tot de instructie die ze kregen?'

Het onderzoek is uitgevoerd op basis van een zogenaamd 'emergent design' (Patton, 2002), resulterend in drie deelstudies naar leerlinginteractie tijdens verschillende vormen van zelfstandig werken. Het onderzoek startte met een exploratieve studie naar leerlinginteractie tijdens zelfstandig werken in de reguliere klassensituatie. Op basis van de resultaten van dit onderzoek is een tweede exploratieve studie uitgevoerd tijdens een andere vorm van zelfstandig werken, te weten samenwerkend leren. Deze studie richtte zich niet alleen op de interactie van de leerlingen, maar ook op de instructie van de leraar. De resultaten van de eerste en de tweede studie samen leidden tot de derde studie waarin een kleinschalig experiment werd uitgevoerd met een drietal leraren om te onderzoeken of leerlinginteractie tijdens zelfstandig werken kan worden beïnvloed.

De interactie van leerlingen en leraren is geanalyseerd op basis van Mercer's (2004) voorstel voor 'socio-cultural discourse analysis', een methode waarin gebruikt wordt gemaakt van verschillende benaderingen, zowel kwalitatief als kwantitatief. In dit onderzoek is gekozen voor een combinatie van kwantitatieve analyse van leerling-

interactie op basis van een conceptueel raamwerk van taalfunctie, in combinatie met een inhoudsanalyse van de interactie zelf.

Het conceptueel raamwerk waarmee de interactie van leerlingen is gecodeerd, is geconstrueerd op basis van zowel literatuur als tijdens het onderzoek verzamelde data en werd in iedere studie aangepast aan de specifieke interactionele situatie. Het raamwerk onderscheidt vier functies van taal die ieder een specifiek gebruik van taal beschrijven. Deze functies kunnen worden beschouwd als geïntegreerd: iedere taaluiting heeft in het dagelijks gebruik meerdere functies. In dit onderzoek wordt er echter van uitgegaan dat in iedere uiting één taalfunctie dominant is, in relatie de context waarin de uiting wordt gedaan.

De eerste functie van taal die wordt onderscheiden is de *sociale* functie, waarin taal wordt gebruikt om sociale relaties tussen mensen te construeren en te onderhouden. De tweede functie die wordt onderscheiden is de *instrumentele* functie van taal, waarin taal wordt gebruikt om een doel in de realiteit na te streven en te bewerkstelligen. Binnen de instrumentele functie worden twee karakteristieke manieren van gebruik onderscheiden. Taal wordt *procedureel* gebruikt als instrument om de correcte manier van afhandelen van de taak vast te stellen en taal wordt *inhoudelijk* gebruikt als instrument om het antwoord op de taak de verkrijgen en te formuleren. De derde functie die wordt onderscheiden is de *pedagogische* functie van taal, waarin taal wordt gebruikt om anderen intellectuele hulp te bieden of ze hierom te vragen. De vierde functie van taal die wordt onderscheiden is de *exploratieve* functie, waarin taal wordt gebruikt voor het construeren van kennis. Voor iedere functie van taal werden karakteristieke taalhandelingen, interactie patronen en interpersoonlijke handelingen onderscheiden om het coderen te vergemakkelijken.

De beschreven leerlinginteractie is geïnterpreteerd in termen van ‘communities of discourse’ (Bruffee, 1984, 1986). Ieder mens is lid van meerdere communities of discourse die worden gevormd door een groep mensen met hun eigen perspectief op de werkelijkheid en hun eigen manier van praten, ofwel een eigen discourse. Binnen zo’n community heerst een onuitgesproken idee over wat hoort en over wat goed en passend is op het gebied van kennis en waarden. Op school spelen verschillende communities of discourse een rol. De school zelf kan worden gezien als een community of discourse, net als ieder schoolvak. In dit onderzoek werd de klas gezien als een omgeving waarin leerlingen aan deze discoursen deel kunnen gaan nemen en lid kunnen worden van de bijbehorende communities, door de taal van die community te leren spreken.

De eerste deelstudie is een onderzoek naar leerlinginteractie tijdens een reguliere vorm van zelfstandig werken, met als centrale vraag: ‘Hoe praten leerlingen met elkaar tijdens zelfstandig werken?’ In vier lessen, Engels, economie, biologie en geschiedenis, werden audio-opnames gemaakt van de interacties van drie leerlingparen op de momenten dat ze door de leraar zelfstandig aan de slag werden gezet met werkboekopdrachten die een antwoord vereisten dat ofwel goed ofwel fout was. De leerlingen bleken in zo’n 80% van hun interactie over de taak te praten, de overige 20% spraken ze

over privé-zaken. In het praten over de taak gebruikten de leerlingen vooral de instrumentele functie van taal. Dat betekent dat leerlingen taal vooral gebruikten als praktisch middel om de taak te voltooien. De instrumentele functie van taal werd ongeveer evenveel inhoudelijk als procedureel ingezet. Leerlingen besteedden een groot deel van hun interactie aan het helder krijgen van wat ze precies moesten doen.

De leerlinginteractie liet een aantal situaties zien waarin de exploratieve functie van taal werd gebruikt. Echter, deze situaties werden altijd ofwel afgekapt door een van de leerlingen met verwijzingen naar de correcte procedure ofwel genegeerd. De exploratieve functie van taal werd behandeld als een onnodige en niet passende vorm van taalgebruik. De vraag was waarom dit gebeurde. Verder onderzoek naar onder meer de aard van de verbale instructie van de leraar wees uit dat deze grotendeels overeenkwam met de manier van praten van de leerlingen. De verbale instructie liet geen andere functie van taal zien dan de instrumentele functie. Daarbij richtten leraren zich nagenoeg alleen op de te volgen procedure. De inhoud van de taak en het schoolvak speelden nauwelijks een rol in de instructie.

Geïnterpreteerd in termen van het deelnemen aan een discours, lijkt het taalgebruik tijdens zelfstandig werken erop te wijzen dat leerlingen niet deel gingen nemen aan het discours van het schoolvak, aangezien de inhoud van het schoolvak weinig aan bod kwam, maar aan het discours van de school, waarin kennis over correct werken en correcte manieren van praten prevaleren. Het feit dat leerlingen elkaar corrigeerden wanneer schoolvakinhoudelijke kennis wordt geconstrueerd lijkt er verder op te wijzen dat het discours van de school het discours van het schoolvak blokkeert.

In de tweede deelstudie werden leerlinginteractie en leraarinstructie onderzocht in een situatie waarin de taak grotendeels werd geconstrueerd door de leerling zelf en waarin de rol van de leraar eerder ondersteunend en begeleidend was dan instruerend. Deze begeleiding vond plaats in individuele gesprekken met de samenwerkende groepjes leerlingen. De veronderstelling was dat in een situatie die meer gericht was op het stimuleren van kenniscreatie in interactie, de exploratieve functie van taal meer zou voorkomen. De studie werd geleid door de vraag ‘Welke aspecten van leraar- en taakinstructie beïnvloeden het taalgebruik van leerlingen in samenwerkend leren in vergelijking met zelfstandig werken?’

Ondanks de verschillen in de twee situaties verschilde de interactie van de leerlingen in deze studie weinig met die in de vorige. Het taalgebruik van de leerlingen was vooral instrumenteel en vooral gericht op de procedure. Problemen met de taak werden behandeld als procedurele conflicten van autoriteiten, zoals de leraar en het schoolvak, en opgelost door vast te stellen welke autoriteit de meeste status had. Hoewel de taak werd gepresenteerd als een open opdracht, brachten de leerlingen de taak terug tot een taak waarbij het resultaat ofwel goed ofwel fout was en bediscussieerden de taak navenant. De leraar bevestigde deze interpretatie van de taak in zijn voornamelijk procedureel-instrumentele manier van praten in de begeleidingsgesprekken.

Er bleek een relatie tussen de manier van praten van de leraar en de manier van praten van de leerlingen. Ten eerste refereerden de leerlingen in hun interactie vaak naar de exacte woorden van de leraar. Ze volgden zijn instructie minutieus en be-

nadrukten de opmerkingen van de leraar in hun eigen interactie. Ten tweede bleken de taalfuncties die leraar en leerlingen gebruikten sterk overeen te komen in frequentie. Beiden gebruikten overwegend de instrumentele functie van taal in de procedurele modus. De manier waarop de leraar de exploratieve functie van taal behandelde werd weerspiegeld in de manier waarop de leerlingen dit onderling deden: de functie werd als passend behandeld wanneer de geconstrueerde kennis kon bijdragen aan het product waar ze aan werkten en behandeld als niet passend wanneer dat niet het geval was. Ten derde spiegelde de leerlinginteractie de waarden die de leraar uitdroeg in zijn manier van praten. Deze waarden hadden betrekking op zijn visie op wat goed werken was en wat een goed product was. De leerlingen spiegelden de manier van praten van de leraar in hun eigen interactie.

Om leerlingen te stimuleren verbaal kennis te creëren lijkt het niet voldoende om een andere werkomgeving en een andere taak te bieden. Minstens zo belangrijk lijkt de manier van interactie van de leraar te zijn. Als deze vooral gericht is op correct werken en het volgen van de juiste stappen, kortom: vooral het discours weerspiegelt van een meer traditionele vorm van onderwijs in een niet zo traditionele leeromgeving, zal leerlinginteractie vooral dat traditionele discours weerspiegelen. Een nieuwe manier van werken met een oude manier van praten, leidt niet tot nieuwe systemen van waarden en kennis.

In de derde deelstudie werd een kleinschalig experiment uitgevoerd om te ontdekken of leerlinginteractie beïnvloed kon worden door de verbale instructie van de leraar te veranderen ten opzichte van de reguliere situatie. De vraag die leidend was in deze studie was ‘Leidt het veranderen van de leraarinstructie zodat deze meer inhoudelijke en exploratieve functies van taal bevat tot leerlinginteractie met meer inhoudelijke en exploratieve functies van taal tijdens zelfstandig werken aan werkboekopdrachten?’ Samen met drie leraren economie, geschiedenis en wiskunde, werd geprobeerd de verbale instructie te veranderen aan de hand van richtlijnen die geconstrueerd waren op basis van de vorige studies.

Het bleek niet eenvoudig om de leraarinstructie te veranderen. Uiteindelijk veranderden twee leraarinstructies, één naar exploratief, de ander naar pedagogisch. De instructie van de derde leraar veranderde niet. De twee leraren die uiteindelijk een veranderde instructie lieten zien, waren leraren van wie de instructie al deels de beoogde functies van taal bevatte. In dat opzicht was de verandering van de instructie niet zozeer een verandering maar een versterking van een al aanwezig aspect van hun taalgebruik.

De leerlinginteractie die volgde na de meer exploratieve instructie liet meer exploratief taalgebruik zien. De leerlinginteractie die volgde na de pedagogische instructie liet zowel meer pedagogische als exploratieve functies van taal zien. De manier waarop hiermee werd omgegaan door de leerlingen veranderde echter nauwelijks. Na exploratieve opmerkingen verwezen mede-leerlingen nog steeds naar de correcte procedure of negeerden de exploratieve opmerkingen. Na pedagogische opmerkingen werden vaak meta-opmerkingen gemaakt die aangaven dat de pedagogische functie van taal niet behoorde tot het normale interactie-repertoire. De leerlinginteractie die volgde na de

instructie waarin de beoogde verandering niet lukte, veranderde nauwelijks ten opzichte van de reguliere situatie.

De vraag die in dit onderzoek centraal stond was: 'Hoe praten leerlingen met elkaar wanneer ze onafhankelijk van de leraar aan het werk zijn en hoe verhoudt hun interactie zich tot de instructie die ze kregen?' Op het eerste deel van de vraag kan worden geantwoord dat in de uitgevoerde studies leerlingen onderling taal vooral gebruikten als instrument om een antwoord op de taak te formuleren, of deze taak nu een goed-fout antwoord vergde of een tekst van meerdere pagina's. Leerlinginteractie liet ook situaties zien waarin leerlingen kennis construeerden. Echter, deze momenten van kennis constructie werden vaak genegeerd of afgedaan als niet passend gedrag. Op het tweede deel van de vraag kan worden geantwoord dat leerlinginteractie in hoge mate de verbale instructie van de leraren weerspiegelde. Leraren instrueerden hun leerlingen vooral procedureel-instrumenteel en legden nadruk op hoe leerlingen precies moesten handelen bij het werken aan de taak, niet op de vakinhoud.

Geïnterpreteerd in termen van communities of discourse, lijken de conclusies uit de drie deelstudies erop te wijzen dat leraar de representant is van de community of discourse waar hij zijn leerlingen in binnenleidt. Leerlinginteractie spiegelt de manier van praten van de leraar, niet alleen inhoudelijk en in termen van taalfuncties, maar ook op het gebied van de waarden en kennis die de leraar in zijn manier van praten uitdraagt als 'correct'. Leerlingen corrigeerden zichzelf en elkaar wanneer de correcte waarden van de leraar werden aangetast.

Drie verschillende communities of discourse lijken een rol te spelen in de interactie rondom zelfstandig werken. De eerst is de community van het schoolvak dat de leerlingen moeten gaan betreden, de tweede is de community van school en onderwijs in het algemeen en de derde is de community van het wetenschappelijk onderwijskundig discours. Deze communities en het bijbehorende discours speelden alledrie een rol in het onderzoek. In de eerste studie hinderde het schooldiscours verschijningsvormen van het vakdiscours. In de tweede studie waarin de werkvorm was gebaseerd op het wetenschappelijk onderwijskundig discours, verhinderde wederom het schooldiscours het deelnemen aan een nieuw discours. De vraag is zelfs of leerlingen wel aan een discours gingen deelnemen. Het discours dat leerlingen reflecteerden was het discours van de school; een discours waar ze niet aan gingen deelnemen, maar waarvan ze al lid bleken te zijn.

De derde studie laat zien dat de rol van de leraar in de interactie van leerlingen heel belangrijk is. Een veranderde leraarinstructie kan al leiden tot andere leerlinginteractie. Daarbij moet worden opgemerkt dat die verandering niet makkelijk te realiseren is. De community waarin de leraar zich bevindt en de systemen van waarden en kennis die hij daarbij aanhangt, bepalen zijn eigen manier van praten en zijn eigen visie op leren, en uiteindelijk ook die van de leerling. Om leerlingen een ander discours te laten betreden, zal eerst de leraar zich bewust moeten worden van de invloed die zijn lidmaatschap van communities of discourse heeft. Als leraren hun taalgebruik aanpassen aan hun leerdoel, kunnen ze hun leerlingen andere communities of discourse binnenleiden. Daar ligt een aanknopingspunt voor de lerarenopleiding.

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